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THE SENEGA OF COMMERCE.

BY J. U. AND C. G. LLOYD.

Read at Kansas City, Mo., before the American Pharmaceutical Association and communicated by
the authors.

The species of *Polygala* that should yield senega, and which is officinal, is *Polygala senega*, Lin. The localities referred to by the authors of our dispensatories and other writers as furnishing the senega of commerce are the Southern and Western States. Such States of the South and West as furnish senega for the market, and which fact is personally known to us, are Kentucky, Virginia, Tennessee, North Carolina, Arkansas, Missouri, Ohio, Indiana and Illinois.

Doubtless small amounts of senega are also derived from the northern portions of other Southern States and from portions of certain Northern and Eastern States that border the States we have named. In fact the typical species (*Polygala senega*, Lin.) is most common in the Eastern States, and the root of this agrees in appearance and characteristics with senega of the South and West. It has been uniformly the case that all lots of senega examined by ourselves, and which came direct from diggers or first hands from the States mentioned, agree with the accepted descriptions. In connection with the history of this drug, we have made it an object during the past few years to consult brokers and dealers in indigenous drugs throughout the portions of our country that we have named. Their reports confirm, without exception, the above, such senega being known by drug brokers as "Southern senega." In connection with this part of our subject, we beg leave to call attention to the specimen of *Polygala senega*, var. *latifolia*, Lin., of our herbarium which was collected in Kentucky by ourselves and about twenty-five miles south of Cincinnati. This we know to yield a root identical with the officinal and about the same in size and is Southern senega. Senega from all the senega-producing States that we have named agrees in appearance, and as the bulk of it is derived from States south of the Ohio river, the term "Southern senega" has been accepted as applicable

to the drug that answers the description and authorities accept as officinal senega. The States of Ohio, Indiana and Illinois were once Western States. Since, the West has moved far beyond, and thus it is that even in Cincinnati, once a Western city, the senega which is derived from these States is called by dealers "Southern senega." This senega reaches our city (Cincinnati) in parcels of from a few pounds to bales of one or two hundred pounds. It comes from country stores and direct from the gatherer. Sometimes it is nice and clean, again it is scarcely washed at all and frequently is gathered with the top attached and in this manner sent to market. Owing to the high price, it is not so liable to admixtures as cheaper roots, but it is not unusual to find others of our indigenous roots mixed with it. There have been several articles written upon this subject in our journals at home and abroad, so that it is not necessary for us to dwell upon this phase of the question other than to say that we believe the larger share of these admixtures to result from carelessness with the digger, rather than from any intention to adulterate. In concluding our remarks upon Southern senega, we call attention to the specimens which accompany—derived as follows: Nos, 1 and 2 from Kentucky and No. 3 from Indiana.

Northern Senega.—Let us bear in mind that the original senega root, and all that was used until about ten years ago, was derived from the sections of country that we have named.¹ To produce it, the typical species, *Polygala senega*, Lin., and *Polygala senega*, var. *latifolia*, are gathered indiscriminately. Until a few years ago, there was no reason for a division of the senegas of commerce. Now, however, dealers in senega speak of "Northern Senega," the distinction being brought about by the appearance in market of a root unlike the original, such being derived from the Northwest, about the 44th degree of latitude, and from the States of Wisconsin and Minnesota. The first consignments of this senega that we have been able to trace were noted about ten years ago. It is very large, sometimes white, again rather dark brown. The knot at the top of the root, from which spring the stems, is often two or three inches in diameter, even of the dried plant. The root, just below the knotty head, is (when dry) from the size of the little finger to that of the thumb of a man. It is from six to ten inches in length and generally destitute of the keel-like ridge which is so marked a characteristic of Southern senega. The root of this Northwestern variety is not so contorted and branched as that of the Southern senega, being large and fleshy. It has the relationship appearance, however, of the Polygalas,

¹ The typical *Polygala senega*, Lin., is native to the eastern portions of the United States; however it does not seem to be in abundance sufficient to repay gathering.—L.

the odor and taste of senega and occasionally (the exception) more or less of the keel-like ridge. The first notice that we can find in print regarding this senega is that of Mr. Wm. Saunders, in the Proceedings of the American Pharmaceutical Association, 1876. Since that day the drug has become familiar in the market, commanding about five cents less per pound than the Southern senega. It has been examined microscopically by Mr. Thomas Greenish ("Am. Journ. Pharm.," 1878) and by Mr. George Goebel, Jr. ("Am. Journ. Pharm.," 1881).² Prof. J. M. Maisch has been interested in this large senega for some years, and once traced a lot of it to Missouri. We have known of one lot that came from St. Louis, Mo., but we question very much if it grew in that State. Doubtless it came, via St. Louis, from its home in the Northwest.

In connection with the history of this drug, we may say that while its origin has been a matter of doubt, and all endeavors to locate it botanically have heretofore failed, we are convinced that dealers have had no reason to preserve silence or secrecy other than for the protection of their interests as tradesmen. It seems to us, however, that the uncertainty regarding the drug has so acted as to unsettle the price, for it has ever been a questionable root and many persons refused to accept it.

Last winter, Mr. W. W. Moser, of Cincinnati, offered to procure for us the entire plant when in season. Mr. Moser is an extensive dealer in indigenous medicinal plants and has been in the business for twenty-five years or more and handles considerable quantities of Northern and of Southern senega. According to promise, Mr. Moser procured from parties that gather the Northern senega (either in Wisconsin or in Minnesota) a specimen of the plant, and we present it (specimen No. 7). It will be noticed that the root of this one plant. is larger in size than the average of the Southern senega, but smaller than the average of the Northern senega. The keel-like ridge exists only for a short distance from the top, and the general appearance of the root is that of the Northern senega of commerce. We call attention now to the plant with root attached, which is fresh from one of the localities which supplies the large senega of commerce. This specimen was furnished us by Messrs. Huber & Co., of Fond du Lac, Wisconsin, a firm that is known over our entire country for its dealings in indigenous drugs. They are first hands

² We take it for granted that the senega these gentlemen examined was the "Northern," as it is the only senega that we are acquainted with that answers the description they give and which is obtainable on the market. Mr. Goebel, it is true, speaks of it as "Southern senega," but we think this simply a confusion of terms and that the drug was likely the regular Northern senega.— L.

for Northern senega, in which they have an extensive trade, therefore the genuineness of these specimens cannot be questioned. The letter which we hold from Mr. Huber is of interest in connection with the habit of this senega. and the past and future history of the drug. It was written in reply to one we wrote asking for information on these points, and we present it to the Association with Mr. Huberts permission.

“DEAR SIR :—In answer to your favor of the 10th inst., would say that senega in our State is already scarce and will in a few years become nearly extinct. The advance of civilization and the introduction of domestic animals is rapidly exterminating many of our indigenous medicinal plants of our native forests and open prairies, among which senega is one of the most important. Our shipments this year will not exceed ten tons.

“It inhabits or grows on high rolling prairies or open timber. We have not found it in forests nor in swamps. We have made several attempts to cultivate it. We have a few plants growing ; but, on the whole, we met with but little success. We are, however, of the opinion that it could be cultivated if the habits of the plant and the natural laws that govern its growth were thoroughly understood.”

Both this and the plant obtained from Mr. Moser are *Polygala senega*, Lin., of a variety that seems to be intermediate between the typical species (*Polygala senega*, Lin.) and the *Polygala senega*, var. *latifolia*. It has narrower leaves than the variety native to the South (see specimen from Kentucky of *Polygala senega*, var. *latifolia* in our herbarium), but the leaves are not so narrow as those of the typical form of the plant, a specimen—from Vermont—of which can also be seen in the herbarium. It agrees exactly with a specimen in our herbarium, to which we call attention, derived from Chicago; and which is also intermediate between the typical species of *Polygala senega* and var. *latifolia*.³

Thus it follows that the plant which has created such a disturbance is botanically the officinal senega. The rich black soil and the climate of portions of those Northwestern States seems to be so well adapted, to this plant that it grows luxuriantly and so as to far exceed in size anything we have ever before known from any species of *Polygala* of our country and to somewhat alter its appearance and the internal structure of the root. This fact has led us to question the authenticity of

³ We invite attention to the lots of senega root which we present and which were obtained direct from the States of Minnesota and Wisconsin.—L.

the drug, to think that perhaps the large senega was derived from some other species of *Polygala*, or even from another genus.⁴

Remarks. —The Northern senega is known as “false senega,” “white senega,” and in one or two instances has been called “Southern senega.” Regarding these points, we find that as it is derived from the officinal species, it is not “false senega.” The term “white senega” is not appropriate, for it is often dark brown (see specimen 6) and in color it does not differ more than other senegas of the market, as can be seen by referring to the two lots of senega we present from Kentucky. The expression “Southern senega” is not admissible, for it does not come from the South and, upon the contrary, the most of the regular senega of olden time was from the South. Undoubtedly, therefore, the large senega will continue to be known by dealers as Northern senega or as large senega.

Since the foregoing was written, Prof. Maisch contributed an article (“Am. Journ. Pharm.,: Aug., 1881, p. 387) on a specimen of senega which he obtained from Alabama and which he thought likely might furnish the large senega of commerce. This Southern species, the *Polygala Boykinii*, Nutt., is the only native species that, to our knowledge, approaches in size the *Polygala senega*, Lin. We exhibit it in our herbarium, and by a comparison with the other species this fact becomes apparent. However, we do not think that it is gathered for market unless the root, as a rule, resembles the officinal senega. We are convinced that it never passes through the hands of Cincinnati dealers, for all “Southern senega” is of the form we present and have described.

REMARKS BY THE EDITOR.—The evidences presented in the above paper, that what hitherto we have called *false senega* is really derived from *Polygala senega*, is very strong, and the facilities enjoyed by the authors of examining drugs in large quantities are such that their statement regarding the large size of this senega root is doubtless correct. Yet, although we have been supplied with samples from perhaps twenty different parties, we have seen it only of about the same size as the ordinary senega, and never unusually large.

⁴ We have planted specimens of this Northern senega and shall endeavor to cultivate the same in localities that furnish the Southern senega, to find if the size of the root is simply due to the influence of soil and climate. It may be that the plant does not differ enough from the typical species and the var. *latifolia* to induce botanists to recognize it as a distinct variety, but that the unusually large size of the root is permanent and will be preserved even in other than its native situations.—L.

On the other hand, we have seen only one specimen of the root of *Polygala Boykinii* and, although this is smaller than ordinary senega, it agrees in its histological relations so well with the so-called false senega, that it might well be collected for the latter if attaining the same size. Indeed, the uniform development of the woody centre and the absence of the inner bark tissue, forming the keel, is so constant that it may be questioned whether a plant with such a strikingly different root will not show other differences—aside from the width of the leaves—which may entitle it to be ranked as a species rather than as a variety.

Five years ago we traced what was called "white senega" to Greene county, Mo., and we have no reason to doubt the correctness of the information then obtained. If correct, the root could not have been gathered in Wisconsin. Since that time we have frequently been informed, on inquiry, that the root referred to had been collected in Missouri or in Texas.

It is evident from the above that the histological examination of the roots of well authenticated species of the American Polygalas is a matter of great interest and importance, and pharmacists and physicians who are in a position to aid in this investigation, by the collection of representative specimens of plants with roots, could thus materially further the object in view.

Since the above was in type we have received from Mr. A. Conrath a number of fresh plants, collected in the Menomonee valley, Milwaukee county, Wisconsin, having leaves like those of the intermediate variety described by Messrs. Lloyd. All the roots are small like ordinary good senega, and, as far as examined, show the one-sided growth and even the rayed character of the wood, when seen upon transverse section; even the keel is indicated in several branches in their fresh state. In fact it is unmistakably ordinary senega. We shall examine these roots carefully at our leisure.

SILPHIUM LACINIATUM, LIN., ROSIN WEED.

Natural order, *Compositæ*; Sub-order, *Tubulifloræ*; Sub-tribe, *Melampodineæ*.

BY LEMUEL IORWERTH MORRIS, PH.G.

From an Inaugural Essay.

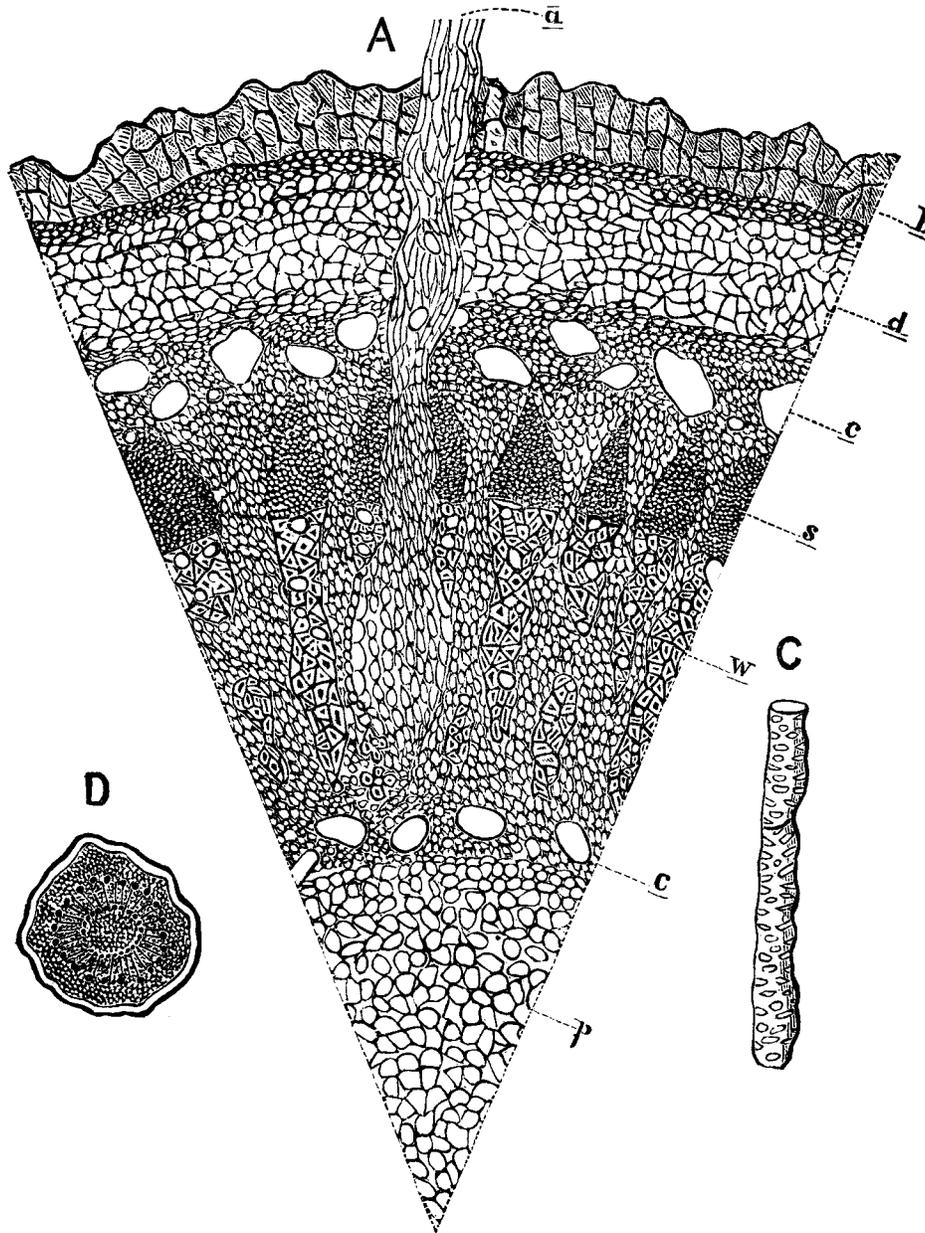
Rosin weed, or compass plant, is found growing extensively westward from Ohio, between 38° to 46° north latitude.

The stem is usually three to six, but sometimes reaches the height of ten feet, and bears, along its entire length, leaves similar to the radical, but gradually becoming smaller toward the apex. The flowers, borne in a kind of raceme at the upper part of the stem, are two to three inches broad, and, as in all the other species, yellow; the scales of the involucre are ovate, tapering into long and spreading rigid points; achenia broadly winged and deeply notched. There arise from the root numerous radical leaves, which are from ten to thirty inches in length, very rough with bristly hairs, in general outline ovate, but deeply pinnately cut and parted, the divisions themselves very often cut-lobed. The root is from one to three feet in length, and one-half to two inches in diameter, and has a very rough and irregular cortical layer. Its anatomical structure is as follows:

Fig. A shows a cross section of the root; the inner portion, comprising one-sixth of the radius of the root, is the pith (*p*) and is composed of loose parenchyma cells; we then find two circles of resin (*cc*) ducts, the inner circle near the dividing line of the woody tissue (*w*) and the pith, and the outer circle between the wood wedges (*w*) and the outer layer of parenchyma (*d*) tissue. These resin ducts are very irregular in shape.

The woody zone between the two rows of resin ducts is traversed by very wide medullary rays; the wood wedges are irregular in shape, and at the head of each is a wedge-shaped bundle of sieve (*s*) tubes, reaching to the outer row of resin ducts. Between the outer row of resin ducts and the cortical (*b*) layer is found a narrow layer of parenchyma cells, which are more compressed as they near the cortical layer, and this latter is composed of very irregular compressed tissue, resembling stone cells, and is of a yellowish-green color.

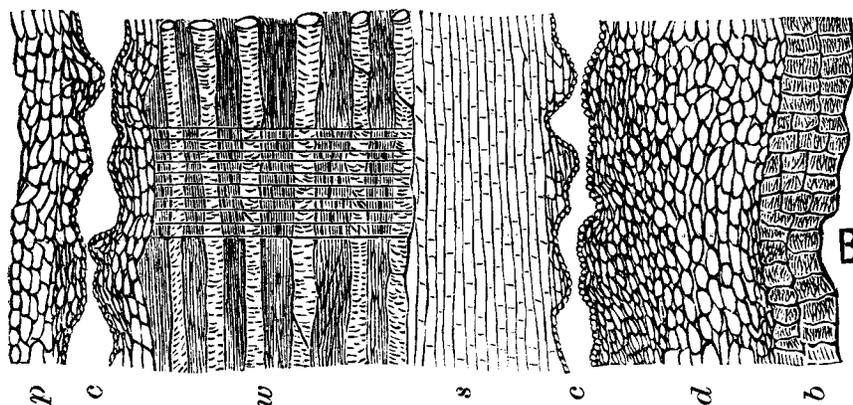
a shows the development of a rootlet; most of the rootlets originate from the inner row of resin ducts.



ROOT OF SILPHIUM LACINIATUM.—A Transverse section, magnified, with origin of a rootlet. C Pitted duct. D Transverse section, natural size.

Fig. B, is a longitudinal section of the root, and shows the very irregular course of the simple resin ducts.

Fig. C shows one of the pitted ducts, which were the only kind found, although some twenty specimens of the root were examined.



Longitudinal section of root.

Fig. *D* is a cross section of the root, natural size, from which the different magnified sections were cut.

Following is the result of an analysis made of the resinous juice which exudes from the stem and foliage of the plant, either spontaneously or from the puncture of insects. It congeals in small translucent, and internally transparent, light yellow tears, of varied forms, breaks with a conchoidal fracture, has an agreeable terebinthinous odor and taste, softens quickly in the mouth, and is easily masticated and kneaded between the teeth; it has the specific gravity 1.039 at 20°C., and upon incineration one gram yielded 6.005 gram or 0.5 of ash.

On treating an excess of the oleoresin with different liquids the following results were obtained, showing the relative solvent power of 100 parts of the liquids: chloroform 24.2, carbon disulphide 23.6; ether 19.3, benzih 18.0, benzol 17.0, alcohol of 90 per cent. 15.2, methyl alcohol 10.2 parts of the constituents of the exudation.

On the spontaneous evaporation of these solutions no crystalline residue was left. The residue left after the evaporation of the alcoholic solution was a yellowish-white waxy mass, with minute transparent globules covering its surface, and which upon examination proved to be volatile oil. A small portion (0.62 per cent of the oleoresin is soluble in water. Chloroform dissolves nearly the whole of the oleoresin, which is insoluble in glycerin.

Subjected to distillation with water, a colorless volatile oil was obtained, having the specific gravity 0.868 at 18°C. It is neutral to test paper, soluble in equal parts of 90 per cent. and in fifteen parts of 80 per cent.

alcohol, and boils at 158°C. It has a distinct terebinthinous odor, and with iodine gives quite a violent action, generating considerable heat. After carefully freeing a portion from water with chloride of calcium it gave a very slight action when brought in contact with metallic sodium, the oil doubtless consisting of a hydrocarbon probably identical in composition with oil of turpentine. The sodium was left in contact with the oil for several days without perceptibly changing its odor, but the oil assumed a light yellowish color.

The watery liquid left in the retort on the distillation of the volatile oil contained sugar, and yielded after some time a brownish precipitate with ferric chloride and white precipitates with caustic alkalies and with the lead acetates.

The residue left in the retort, after complete exhaustion with watery was a brownish-white mass, having an odor while warm very much like that of copaiba. It was completely soluble in chloroform, while carbon disulphide dissolved 97.1 per cent., ether 78.4 per cent., benzin 72.7 per cent. and alcohol (90 per cent.) 5.40 per cent. of it.

The portion soluble in alcohol, after spontaneous evaporation, was obtained in the form of a yellowish extract. It was wholly soluble in chloroform, almost entirely soluble in carbon disulphide, benzin and ether, which solutions by evaporation left residues of the same amorphous character.

The part insoluble in alcohol is whitish, tasteless, falls to powder when rubbed between the fingers, and is wholly soluble in chloroform and carbon disulphide, and only partly soluble in benzin and ether, and upon the evaporation of the liquids was again obtained as an amorphous powder.

A portion of the resinous residue from the retort was soluble in potassa and in ammonia, and reprecipitated by acids, and consists probably of a resinous acid.

Some of the residue was fused with caustic potash, the fused mass extracted with water, filtered, acidulated with sulphuric acid, the solution concentrated and the sulphate of potassium for the most part separated by crystallization; the filtrate was then well shaken with ether, the ether separated and allowed to evaporate spontaneously,

when a whitish residue was left. This tested with ferric chloride did not change color, showing that there was no protocathechuic acid formed by this treatment.

The oleoresin which is gathered by children for chewing gum resembles mastich very much in appearance, but is much less soluble in alcohol, and its constituents seem to be more nearly allied to those of Chian turpentine.

The only part of the plant generally used is the leaves, and a fluid extract prepared therefrom is found in the market. The powdered leaves have also been used in cattle powder as a diuretic.

The oleoresin yielded 19.66 per cent. of volatile oil and 37 per cent of acid resin, the other constituents being wax, sugar, an undetermined white powder and a small amount of inorganic constituents.

PARTHENIUM INTEGRIFOLIUM, LIN.

Natural order, *Compositæ*; Tribe, *Senecionideæ*; Sub-tribe, *Melampodineæ*.

BY FRANK B. MEYER, PH. G.

From an Inaugural Essay.

This plant inhabits the central portion of the United States, growing in moist or dry soil in uncultivated fields. It is a perennial, having a large thick root, to which are attached numerous rootlets varying in size and length, some of them being four or five times as long as the main root. After drying, it is dark brown or blackish and internally, when moistened, shows a greenish color. The woody stem, with branches, attains a height of about three feet. The leaves are alternate, the upper ones sessile, serrate, ovate, acute, six to eight inches long below, an inch or less above. The stem terminates with numerous flowers disposed in a dense corymb. Involucre green, bell-shaped. Ray flowers five, white; heads small.

The tops of this plant having been used for several years, in some sections of Indiana, with good results in the cure of fever and ague, the writer was led to make an analysis, but unfortunately he was limited in his undertaking, only one pound of the tops being procurable in a proper condition.

The material was reduced to a coarse powder, since it was found impossible to powder it finely owing to its resinous qualities. Eight troyounces of the powder were exhausted by percolation with alcohol of sp. gr. .835; from the tincture thus obtained the alcohol was recovered by distillation and the residue macerated for two days with water acidulated with acetic acid. The clear yellowish-red filtrate, tested with potassium iodohydrargyrate, gave indications of the probable presence of an alkaloid; on concentration, separated a minute amount of crystals, which were removed, and was then precipitated successively with acetate and sub-acetate of lead, the precipitate by the former being orange-colored and by the latter lemon-yellow. The filtrate, freed from lead by sulphuretted hydrogen, yielded on concentration a little resin-like substance, and afterwards reddish crystals, which could not be decolorized by recrystallization and yielded, with ferric chloride, a crimson-colored solution, and with Fehling's solution a precipitate of cuprous oxide.

The two lead precipitates were suspended in water, decomposed by sulphuretted hydrogen and the filtrate evaporated; the extract was partly soluble in chloroform, petroleum benzin and ether, and wholly soluble in potassa, the latter solution yielding, with hydrochloric acid, a yellow resinous precipitate.

The drug, exhausted with alcohol, was now percolated with water, the infusion boiled to coagulate the albumen and concentrated by evaporation, when it had a dark-brown color and a bitter taste. The residuary powder, boiled with water, yielded a very bitter liquid in which neither iodine water, ferric chloride or gelatin produced any change. The infusion and decoction were united and, on evaporation, yielded an extract which contained considerable gummy matter and yielded nothing to petroleum benzin, and to ether merely a small quantity of greenish substance.

A portion of the fresh powder, 810 grains, exhausted with petroleum benzin, yielded 17 grains of a dark-green, slightly bitter, waxy substance. The powder was subsequently exhausted with ether and the ether evaporated spontaneously. A crop of tolerably pure crystals was removed, the crystals subsequently forming being contaminated with resinous matter. Water, in which the ethereal extract was boiled, became extremely bitter and separated, on evaporation, clear, very

bitter crystals which, in watery solution, acquired, with ferric chloride, a beautiful deep-red color and did not reduce Fehling's solution. Heated upon platinum foil, the crystals burned without leaving any residue.

On incineration, the powder left 10 per cent. of ash.

The parthenium tops are employed in the form of hot infusion, the strained liquid being preserved by the addition of a quantity of spirit. It should be mentioned yet that the liquid preparations of this drug possess an agreeable orange-like odor.

* * * * *

Anda-assu is the fruit of *Johannesia princeps*, nat. ord. Euphorbiaceæ, indigenous to Brazil. The fruit weighs about 350 grams and contains 50 seeds, from which 48 grams of a clear, reddish, inodorous sweet oil may be obtained. Taken in the dose of 10 grams, four or five evacuations are produced without any nausea, vomiting or irritation of the intestines. Compared with castor oil, it is equally active in smaller doses; is more liquid and has not the disagreeable odor of the latter.—*Phar. Ztg.*

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USTILAGO MAYDIS, Lév., CORNSMUT.

BY JOHN H. HAHN, PH.G.

Abstract of an Inaugural Essay.

This drug is attracting considerable attention as a substitute for ergot of rye. It is claimed that it is equal, and in many cases superior, to ergot of rye, producing clonic instead of tonic contractions of the uterus, and thus more nearly simulates natural labor. Besides, its cost is about 50 per cent. less than that of ergot of rye. A dozen or more years ago it received a brief notice as an oxytocic by the German profession, but for some unaccountable reason it has since fallen into disuse by the regular profession. The homoeopaths have dispensed the drug in their triturations and dilutions since the year 1866, when it was first noticed by Professor S. M. Hale of their school.

Microscopically it is quite a curiosity. The whole mass is found to be

made up of spores, nodular when moist and of a very minute size, held together by a few threads of mycelium or binding fibres. The following experiments were made with cornsmut:

The moisture present was determined to be 10 per cent. by gently beating 100 grams for several hours. Ether took up 2.5 per cent. of dark-brown fixed oil, having an acid reaction and an odor similar to that of the drug and being readily soluble in petroleum benzin, carbon bisulphide and chloroform, but insoluble in alcohol and pyroxylin spirit.

The powder, exhausted by ether, was percolated with carbon bisulphide, on the evaporation of which a few flat crystals were obtained;

Water now yielded a liquid from. which, by alcohol, 1.5 per cent. of dark-brown gummy matter was precipitated, the liquid having an acid reaction; on setting it aside for several weeks, 3 per cent. of yellowish crystals were separated which were soluble in nitric acid, but insoluble, or nearly so, in ether, chloroform, water and alcohol, either hot or cold, and which, on being heated upon platinum foil, left a white ash.

By boiling the drug with water, a small amount of waxy matter could be separated and the distillate had a very disagreeable odor.

On incinerating the drug, 4 per cent. of gray ash was obtained, which was not further examined.