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THE ROOT OF PHYTOLACCA DECANDRA, LINNE.

BY EDMOND PBESTON, JR., PH.G.
From an Inaugural Essay.

No plant among us is more conspicuous in the fall than the poke for its large clusters of annual purple stems, covered, at the top with ovate-oblong leaves, and bearing large pedunculated racemes of fine purple colored berries. A peculiar phenomenon was noted while observing Phytolacca at night in the fall, the leaves presenting a phosphorescent appearance in the dark. This peculiarity not being mentioned in any of the Dispensatories, a further search was made for a record of such a phenomenon in connection with this plaafc, and the following was found in Gmelin's Chemistry, vol. i, p. 188 :

"Some plants emit in the dark a faint, continuous light, probably resulting from the formation of some substance which burns and emits light at ordinary temperatures, and consists, not of phosphorus, but more probably of a compound containing carbon and hydrogen. The leaves of *Phytolacca decandra* have been observed to shine in September from 9 till 12 o'clock at night, sometimes with blueish-green, sometimes with yellowish-green light, accordingly as the current of air was stronger or weaker; they also remained luminous after being wiped."

The large perennial root, in some specimens from 8 to 10 inches in diameter, has an expanded crown where the numerous stems are joined, This thick part of the root grows perpendicularly to the depth of 12 to 18 inches, where it divides into from two to four nearly equal branches, which extend horizontally, in different directions, from 6 to 10 feet, from the main root, and gradually taper in size. These main branches seldom divide again, but irregularly send off smaller ones.

Estimation of Moisture.—100 gm. of the fresh root, sliced in thin pieces, was allowed to dry in the air to the condition as it is found in commerce,

losing thereby 72.84 gm. On continued exposure in a drying chamber until it ceased to lose weight a loss of 7.889 gm. was noted, showing a total of 80.729 per cent. of moisture and 29.046 per cent. In the air-dried or commercial root.

Ash,—10 gm. of the powdered (air-dry ?) root yielded an ash weighing .84 gm., equal to 8.4 per cent. Of this ash .68 gm. was soluble in water, .16 gm. insoluble. Potassium was found to be the principal base in the soluble portion, by precipitating it with saturated solution of bitartarate of sodium; it equals nearly 5.5 per cent. KOH of the powdered root. The large amount of potassium salts found in this drug is noticeable. A little sulphuric and hydrochloric acid, besides carbonate, was found in this portion. The ash insoluble in water yielded to hydrochloric acid a little calcium and iron, and left silica behind.

In the following experiments the fresh root was used. The experiments of Donnelly ("Am. Jour. Phar." Oct., 1843, p. 165) and W. F. Pape (*Ibid*., Dec., 1881, p. 597) were verified in so far as to the finding of starch, tannin, gum, sugar, resin, fixed oil and lignin. In view of the rapid deterioration of Phytolacca root on keeping, and the probability of its containing an alkaloid, as pointed out by W. F. Pape, the first experiments made were in search of a volatile alkaloid.

A strong tincture of the root, prepared with diluted alcohol, and made alkaline with solution of potassa, was distilled in a glass retort, and the distillate, having a strong, disagreeable odor of the root, was caught in distilled water slightly acidulated with sulphuric acid. After concentration, the tests for alkaloids were applied, with negative results.

A portion of the root was finely broken up and macerated in cold water for 24 hours, then , the whole introduced into a retort and distilled in a salt water bath. The distillate had the characteristic odor and acrid taste of the root, and a strong acid reaction. The acid distillate was set aside and the contents of the retort divided into three portions. With the first distillation was continued as before, but no change took place in the distillate. The second and third portions were distilled separately after the addition of solution of potassa and sulphuric acid to each respectively, and still no change could be noted in the distillate.

The first acid distillate was then carefully neutralized with solution of potassa. A change of color was here noted as the liquid neared

neutrality, the colorless liquid changing to a pale light yellowish-green, and at the same time the odor almost entirely disappeared. The solution was slowly and carefully evaporated to a small bulk, and, on allowing to stand, a small crop of nearly colorless acicular crystals separated. These had an acrid taste, resembling that of the root, after remaining in the mouth a short time. On being treated with acids the salt was decomposed, the acid going off with effervescence, and giving the characteristic strong disagreeable odor of the root in an intensified degree. The crystals I consider to be the potassium salt of a volatile acid characteristic of Phytolacca root.

A strong decoction of the root was precipitated with solution of sub-acetate of lead, filtered, and the lead precipitated from the filtrate by a current of hydrosulphuric acid gas; again filtered, and a portion evaporated to a small bulk. This was divided into four parts, and tested for alkaloids with phosphomc lybdic acid, tannin, iodohydrargyrate of potassium and auric chloride; each gave a precipitate indicating the presence of an alkaloid, to separate which the following method was used:

The filtrate from the lead precipitate was carefully concentrated and mixed with an equal volume of saturated alum solution. The mixture was heated, ammonia added in slight excess, the whole evaporated on a water-bath, and the residue powdered and extracted with alcohol. On evaporating the alcoholic liquid a yellowish mass of small crystals was obtained. This was redissolved in alcohol, the solution passed through animal charcoal and carefully evaporated, when small, nearly white crystals were left. These were quite soluble in alcohol, moderately so in water and nearly insoluble in ether and chloroform. They were entirely dissipated when heated upon platinum foil, and in aqueous solution gave precipitates with the four alkaloidal reagents before mentioned. With strong nitric, sulphuric or hydrochloric acids the crystals simply dissolved, giving no characteristic color test.

The alcoholic solution of the crystals, neutralized with diluted hydrochloric acid, on concentration yielded nearly colorless acicular crystals, which were moderately soluble in alcohol, quite soluble in water, and possessed a strong acrid taste.

From these results I conclude that the crystals were those of an alkaloid contained in Phytolacca root and of the hydrochlorate of the same, for

which I propose tlie name of *Phytolaccine*.

LABORATORY NOTES.

ABSTRACTS FROM THESES.

Cantharides.—Emien Martin determined the amount of cantharidin obtainable from commercial cantharides and powdered cautharidea by the method of Procter and Mortreux (chloroform and carbon bisulphide). One specimen in which the soft parts had been destroyed by mites yielded no cantharidin; a second specimen probably old, left an uncrystallized wax-like substance not further examined; a third specimen attacked by mites, gave .38 per cent. of cantharidin. Five specimens of the powder yielded respectively .25, .30, .48, .49 and 1.06 per cent. of cantharidin; the sample yielding the largest amount, being destitute of green lustrous particles, was most likely made from Chinese blistering beetles.

Distilled Water of Wild Cherry Leaves.—George E. Spangler collected the leaves of Prunus serotina in the latter part of June, 1883. After macerating $12^{1}/_{2}$ troy ounces of the well bruised leaves with $4^{1}/_{2}$ pints of water, 18 fluidounces were distilled over, the distillate containing hydrocyanic acid. The leaves collected in July yielded a stronger distillate. It is thought that if the quantity of distillate was made equal in weight to the leaves, the strength of the water would amount to 0.1 per cent. HCy.

Spigelia.—William C. Boynton, on examining true pinkroot obtained the following results: Moisture 8.621, benzol extract (resin, wax and fat) .518, alcohol extract (resin, tannin, extractive) 7.418, and water extract (gum, tannin, extractive) 11.008 per cent.; with diluted alcohol 18.64 per cent. of extract were obtained.

Phlox Carolina contained 9.5 per cent. of moisture and yielded with diluted alcohol 17.57 per cent. of extract. The ash is stated to have amounted to 18.8 per cent., and for spigelia to 20.5 per cent.; a quantitative determination of its constituents was not made.

Stigmata Maydis have been examined by John M. Hillan. He found fresh corn silk to contain 83.3 per cent. of moisture, and the well dried

drug to reabsorb water from the atmosphere quite readily. Dry corn silk yielded 12.5 per cent. of ash containing carbonates, chlorides, phosphates and sulphates of potassium, magnesium and calcium, alumina and silica. Benzol extracted 2 per cent., the extract having a brown color and containing fixed oil and resin. Alcohol of 80 per cent. yielded 26.05 per cent. of extract, containing tannin and chlorophyll, and water subsequently dissolved 2.25 per cent. of extractive. Sugar was found in green, but not in dried corn silk. Distillation with water did not yield a volatile oil; on distilling with potassa, as alkaline liquid was obtained, which on being evaporated with acetic acid yielded crystals, and the solution of which was precipitated by iodine and by Mayor's solution.

Fluid Extract of Corn Silk.—J. M. Hillan prepared a fluid extract by M. Kennedy's formula ("Amer. Jour. Phar." 1883, p. 243), and found it to occasion a precipitate. Made from the dried corn silk by the same process, the preparation was permanent but the author recommends to increase the glycerin, using for 100 Gm. of dry corn silk 25 Gm. of glycerin and sufficient diluted alcohol to obtain 100 Ccm. of fluid extract.

C. H. Oberholtzer observed that the fluid extract prepared by Mr. Kennedy's formula would ferment (?) and recommends as a menstruum a mixture composed of two parts of alcohol and three parts of water, using 100 Gm. of green corn silk for obtaining 100 Ccm. of fluid extract.

Syrup of Corn Silk.—J. M. Hillan recommends dissipating the alcohol by mixing 12 parts of the fluid extract with 65 parts of sugar, and after the alcohol has evaporated, adding 5 parts of glycerin and sufficient water to make 100 parts.

C. H. Oberholtzer recommends mixing 35 parts of his fluid extract with 65 parts of simple syrup.

Syrupus Myrrhæ.—Abraham L. Ballinger examined several specimens of myrrh and powdered myrrh, and offers the following formula for a syrup:

Take of Tincture of myrrh	℥ij
Magnesium carbonate	℈i
Sugar	℥xij
Water	sufficient.

Rub the tincture with the magnesium carbonate, afterward with 8 ounces of water, filter and dissolve in the filtrate the sugar. The syrup should measure 16 fluidounces. It has an agreeable flavor, makes a good vehicle for administering nauseous medicines, and can be made to take the place of syrup of tolu.

BARK OF "BOIS PIQUANT."

BY E. HECKEL AND F. SCHLAGDENHAUFFEN.

The bark examined was the variety peculiar to Guiana, and agreed exactly with Guibout's description of *Zanthoxylum, caribaeum*. Its anatomical structure is entirely different from that of angustura bark, which it resembles in external appearance. When macerated with water, it yields a bitter, slightly acid, yellow solution, which turns brown with ferric chloride, and yields an abundant yellow precipitate with mercuric chloride, stannous chloride, tannin, picric acid, double iodides, or phosphomolybdic acid, but gives only a slight turbidity with lead acetate. Nitric acid produces a deep red color. When extracted with light petroleum, the bark yields a considerable quantity of chlorophyll, fat, and wax, together with a crystalline substance which can also be extracted by alcohol. This substance forms colorless needles of the composition $C_{12}H_{24}O$, which melt at 285°, and gives no coloration with nitric, sulphuric, or hydrochloric acid.

If the alcoholic extract, after separation of these crystals, is diluted with water, mixed with lime, evaporated to dryness, and the residue extracted with boiling alcohol, a second crystalline substance is obtained which resembles the vegetable alkaloids in its general properties. It exists in the bark only in very small quantities. With nitric acid, it gives a deep-red coloration, but if the liquid is evaporated on a water-bath and mixed with stannous chloride, no violet color is produced. Sulphuric and hydrochloric acid have no action on it, but sulphuric acid and potassium dichromate, manganese dioxide, or lead dioxide, produce a violet coloration similar to that produced by strychnine mixed with a little selenium. An alcoholic solution of bromine also produces a deep blue coloration which persists for a long time. Five mgrms. of this alkaloid injected in aqueous solution beneath the skin of a frog, produce rapid general paralysis, followed by death in about half an hour, and

similar effects are observed with rabbits and guinea-pigs.

A nitrogenous resinous substance, soluble in water, was also obtained from the bark. It has the general properties of the alkaloids, and in its physiological action very closely resembles the crystalline alkaloid just described, although it differs from it in physical properties. None of the so-called xanthopicrite could be obtained from the bark.— *Compt. rend*., 98, 996-998; *Jour. Chem. Soc*., August, 1884, p. 848.

THE BEE-KEEPING INDUSTRY IN AMERICA.[1]

BY JOHN L. DOW.

In nothing has there been greater progress displayed throughout America during the past half-dozen years than in the keeping of bees. Formerly success in bee-keeping was attributed largely to "luck," and the variety of systems practised by different bee-keepers was only equalled by the multiplicity of designs adopted in the construction of the hives. A specialty of the American farm, as seen to-day, is its apiary, as the rows of hives are called, which are marshalled along at distances of from five to seven feet from each other in some convenient situation near the garden or orchard. And what arrests attention is the similarity of pattern in these square white painted hives. From California to Massachusetts one would think that the keepers of bees had obtained their hives from one maker. You find, however, that nearly every State has its own special make of beehives, but the differences are only in detail, and do not interfere with the general plan that seems to govern these square boxes. We eventually discover that bee-keeping in America is now everywhere reduced to principles that are as much distinguished for their certainy of operation as formerly the occupation was noted for being one essentially of guess-work.

Although bee-keeping to the extent of apiaries comprising from a dozen hives or so up to about fifty is general among the farms and orchards, the big bee ranche, whose proprietor devotes his whole attention to the industry, is also quite an established American concern. It is estimated that for the year 1882 there were 70,000 bee-keepers in the United States, possessing among them a total of 2,000,000 hives, averaging 20 lbs. of honey each, which at the low average of 10 cents per lb.

1 From the Leader. Reprinted from the *Tropical Agriculturist*, August 1. 1884.

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represented a total of $4,000,000, besides 20,000,000 lbs. of wax, worth $6,000,000, or a total for the year's crop of $10,000,000. Of these amounts, honey and wax to the value of $1,200,000 and $700,000 respectively were exported for the same year. Among the bee-keepers in the Eastern States the work of what is called “wintering the colonies” is a very serious portion of the bee-keepers responsibility; but in the more genial and Australian-like climate prevailing along the Pacific Coast, between San Francisco and Mexico, the bee industry is carried on under the most favorable conditions. In Los Angeles County, Southern California, there are two hundred apiaries, aggregating 12,000 hives, from which it is estimated that an average of 500,000 lbs. of honey is taken annually; and one large producer, Mr. J. S. Harbison, sent through to New York on one occasion a consignment of honey and wax amounting to ten car loads of 20,000 Ibs. each, or 200,000 pounds in all. Among individual yields vouched for at Los Angeles is one where from a single hive during the season 566 lbs. of honey was taken, some of which, owing to its purity and the superior manner in which it was got up for market, reached 50 cents per lb.

The square box form of the hives that has already been alluded to, was adopted as far back as 1851, almost about the same time by the American and German bee-keepers, Langstroth and Dzeron respectively, to admit of working their movable comb improvement, an invention which has led the way to all the recent bee-keeping improvements. It is strange that the complete revolution in bee management effected by the early discoveries of these two men should only have taken place within the past few years; and it is no less notable that in 1883 the Langstroth hives are making their way all over America with little alteration in their design to those first submitted by Mr. Langstroth in 1851. Instead of the old straw hive, in which the bees were smothered previous to the honey being promiscuously tumbled out, all mixed up with larvae, wax and broken comb, the modern hive is fitted with square frames, which can be lifted out and dropped in again at will, just as panes of glass are handled in a glazier's box. These frames are what the bees build their comb upon, and set to work at filling with “extracted” or “box” honey respectively, just as their owner may desire.

Extracted honey is that which is separated from the comb, and box honey the kind that is sold in boxes holding a pound or so of honey, and in the form that it comes from the hive. For extracted honey, full sized

frames are used in the hive, but for box honey the frames are subdivided into the boxes within which the bees are to construct the honey-filled comb in the shape intended for market. When the full frames are charged with honey, another achievement in the new beekeeping system is brought into operation, viz., the honey extractor. This is an ingenious contrivance, resembling in appearance the square frame of a street lamp, the sides of which are fitted with honey-charged frames from the hives, and the whole then inserted within an enclosure like an oil drum, fitted with a tap. The apparatus, with its frames of honey, is fitted into pivots above and below, and is then swiftly rotated by a tooth and pinion attachment. The honey, by centrifugal force, is thus thrown from the frames, and is drawn off by the tap in the enclosing drum.

“Comb foundation” is another of the improvements. The bees, it appears, if left to themselves, not only occupy too much of the honey-making season in comb building, but also work up too much valuable material to suit the commercial notions of the modern bee manager. Honeycomb is made of pure wax, which the working bees exude from minute folds of their bodies in the shape of thin flakes or scales. It is estimated that every square inch of comb built by the bees is done at the expense of from fifteen to twenty times its weight in honey. Thus the bee-keeper resorts to comb foundation, and by saving the bee the work of making it, obtains the extra honey. A little machine with iron rollers, resembling in form the wringer in a clothes washer, is used to roll out beeswax into thin sheets of comb foundation. These are fastened on the frames, and the frames dropped into their places in the hive, when the bee proceeds at once to business.

At first, comb foundation was not a success, and it was discovered that the hitch occurred in the sheets being rolled out plain. The bees would not work because they could find no trace of cells. Then an enterprising inventor engraved his rollers, so as to stamp the sheets of beeswax with a perfect imitation of the bees' cells, when, thenceforth, the busy little insects buckled down to work with as much satisfaction as if they had made the sheets themselves. Some bee-keepers roll out their own foundation, but most obtain it from one of the many suppliers of bee-keeping requisites that are to be found all over the United States. Here is one of their advertisements:— “We are prepared to promptly fill all comb foundation orders at the following prices—one to ten lb., 55 cents per lb.; fifty lb. or over, 50 cents per lb.; 100 lb. or over, 45 cents per lb.

Our largest sheets are 12 X 12 inches, and run from 5 to 8 square feet to the pound. In ordering give inside dimensions of frames. If ordered by mail add 25 cents per pound to above charges for postage and extra packing; samples by mail, post paid, 5 cents."

Another triumph of the new system is the "smoker," by which the most nervous person can handle and work among the bees with the utmost safety. Formerly a few individuals in a locality were regarded with considerable veneration, owing to their possession of a supposed mysterious influence that prevented bees from stinging. The whole art of bee taming is now found to consist in the fact that bees will not sting when filled with honey; that to get them to fill themselves it is necessary to frighten them, and that the necessary frightening is effected by puffing a little smoke into their hives. For this purpose the smoker, which is a painted tin funnel filled with smouldering rags and having a small bellows attached, forms one of the bee-keeper's indispensable tools of trade. The handy manner in which the bees can be inspected by puffing a little smoke into the hive, and then lifting out any section of the movable combs, enables the condition of the colonies to be constantly noted.

The first step on the part of new beginners in bee-keeping is to post themselves in the interesting study of bee physiology by obtaining one of the numerous books on the subject. The best works among American publications are:—King's "Bee-Keeper's Text-Book," Langstroth's "Bee Book," Quinby's "New Bee-Keeping," Root's "A. B. C. of Bee Culture," and Cook's "Bee-Keeper's Guide." A prosperous hive or colony of bees consists of a fertile queen, a few hundred drones and about 40,000 workers. The queen is the prolific parent of the whole colony, and laying eggs is the sole end of her existence. In the height of the honey gathering season, and under favorable circumstances, the queen will deposit about three thousand eggs per day. She is distinguished from the other bees by being larger and having smaller wings. The drones are bulkier than the queens, but shorter, and have large wings, but are destitute of a sac for carrying honey and incapable of performing the duties of the workers. Their business is the fertilization of the queens, and as impregnation is effected while on the wing, the drones leave the hives in considerable numbers about noon on fine days, and are followed by the young queens. When the service of fertilization is supposed to be accomplished, the workers drive out the drones and keep them out till they die of starvation.

One of the many advantages of working the movable comb hive is that all excess of drone comb (which differs from the honeycomb) can be removed, and the production of useless consumers thus kept in check. The workers are the smallest in size of the three classes of bees, and, although females, are incapable of fertilization by the drones, so that, although they occasionally lay eggs, these never produce working bees. Upon the workers devolve all the labor of building comb, collecting the honey and feeding the queen and brood. Their average age varies from a few weeks in summer to from six to nine months during the remainder of the year. The queen's average age is, from three to four years, and should her death occur the workers construct large cells, supplying them with what is described as "royal jelly," so that the eggs or larvae that otherwise would have produced worker bees are developed into queens. Only one queen is allowed to remain in each hive. The queen usually leaves the hive when about five days old to meet the drones in the air for fertilization, which being accomplished, serves her for life, as she seldom afterwards leaves the hive, excepting in company with her first swarm.

The average time from the laying of the egg to the appearance of the perfect insect is for the queen sixteen, for the worker twenty-one, and for the drone twenty-four days respectively. The cells in which the workers are reared are the smallest in size; those for the drones nearly one-third larger, and for the queen still larger and of peculiar form, requiring as much material for their construction as fifty worker cells. In strong colonies, having plenty of stores, the queen will often deposit eggs during every month in the year, the least brood being during the three winter months. On the approach of spring an increase of brood rapidly sets in, and the bee-keepers prepare for their annual harvest of swarms and surplus honey. From three to ten queen cells are generally constructed in each hive, and in about eight days after the first queen leaves with the first swarm the next queen is ready to emerge from her cell.

An important feature in connection with the movable comb system of bee management consists in the old chance method of swarming being supplanted by what is called artificial swarming. Instead of the bees being left to swarm naturally, with the risk of being lost, the swarming is conducted at the will of the operator by the removal of the queen to a new hive, where she is followed in a most docile manner by the

swarming bees. Another important advantage that the new system of bee-keeping affords consists in what is called nucleous swarming, by which a queen is reared amid a small cluster of bees in a separate hive until she matures and becomes fertilized, when the hive that is to be swarmed is shifted, and the nucleous hive put in its place. In this way the surplus bees from the shifted hive go out as usual, to their work of honey gathering, and according to the law which directs them back to the exact spot of their old habitations, take possession of the new hive and continue their operations under the new queen that they found established there to receive them. The chief gain made by this expedient is one of time, a commodity that is of special value during the honey season.

The introduction of a fertile queen to a colony is often in this way effected a fortnight earlier than they would swarm naturally, and this in a large apiary amounts to a very considerable aggregate gain. Sometimes the facilities presented by the movable comb system are called into requisition for quite a contrary operation, viz., the prevention of swarming when an increased amount of honey may be desired instead of multiplied stocks. When this is the case the frames are lifted out until the queen is found, when one of her wings is clipped, thus preventing her from flying away, and consequently putting a stop to the swarming. In preparing for wintering the bees also it is a common practice to join two colonies, so as to get through the non-producing season upon the most economical terms; a full hive, owing to being able to maintain the proper degree of warmth, requiring less food. All such handlings as these various processes involve are enabled to be carried out under the movable comb system with the utmost certainty and exactness of operation. Further details with respect to varieties of bees, bee pasturage, and other matters, will have to be dealt with in another paper.—*Phar. Jour. and Trans.*, September 27, 1884, p. 249.