

unrectified oil indicated an appreciable saponification value after acetylation. It was also found that fraction 8, b. p.<sub>27</sub> = 125–30°, had a high saponification value. Fractions 7, 8, and 9 were thereupon united, freed of pulegone by the neutral sulphite method, rectified, saponified, and again rectified. The resultant oil was found to distil over a wide range, 160–240° C. Each significant fraction was treated with phenylisocyanate. However, only diphenyl urea resulted. With different materials attempts were made to freeze out menthol, with negative results.

#### SUMMARY.

The strain of a so-called Japanese peppermint which is being cultivated at the Wisconsin Pharmaceutical Experiment Station has been shown to yield a volatile oil containing largely *d*-pulegone. *L*-limonene is the only other constituent of the oil definitely identified. Careful search for both menthone and menthol has so far failed to reveal the presence of either compound.

The study of the non-pulegone fractions of this oil is being continued with much larger quantities of oil.

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## MEDICINAL PLANTS OF THE AZTECS WHICH ARE STILL IN COMMON USE IN MEXICO.\*

BY CHARLES BRAUBACH.

When the Spanish conquerors first arrived in Mexico in the year 1521, they were surprised to find there a number of the most beautiful botanical gardens, as for example in Texcoco; that of Chapultepec and the royal gardens of Montezuma. The gardens of Chapultepec are now the magnificent park of the same name in the city of Mexico, and known to all visitors, with its giant conifer trees, called *Ahuehuetes*, an Aztec word, and surrounding the castle of Chapultepec, the residence of the presidents of Mexico. Many of these big trees are said to be about one thousands years old and are arranged in lanes, through which footwalks are leading.

According to the old Spanish historians, these botanical gardens of the Aztecs were in existence long before the discovery of the American continent; the oldest is stated to be that of the king of Texcoco, whose name was Netzahualcoyotl. This king had a large array of live plants and kept in his palace a collection of such desiccated plants from other regions as would not grow in the soil of his gardens, thus he became the founder of a museum of natural history. According to "Prescott's History of the Conquest of Mexico," Book VI, Chapter II, the gardens of Texcoco were arranged in such a manner and with such taste that one could safely say there was nothing equal in Europe at that time. In these botanical gardens a classification and arrangement of the plants could be observed: trees, medicinal plants, plants bearing flowers with fragrant odor and plants yielding dyes, with subdivisions of those resembling each other. One of the old Spanish monks by the name of Moxó expressed his opinion that the European botanists followed the

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\* Scientific Section A. P. H. A., Buffalo meeting, 1924.

footsteps of the Aztec herbalists, using their ideas as guides in botanical classification, likewise paying special attention to the flowers, fruits and leaves. Entirely original was the classification of medicinal plants based on their respective therapeutic properties, uniting them into groups, according to their action, and giving them names which clearly express their therapeutic use. To the plant which alleviates headache they gave the name medicine for the head; the plant causing sleep they called medicine for sleep; the plant which is good for the chest they gave the corresponding name. These Aztec names for medicinal plants, as well as many others, are still in general use in Mexico. The names are mostly compound words and derivatives, coined, as we would say, and frequently quite lengthy.

For example, we have here the *Talauma macrocarpa*, *zucc.* *Yoloxochiil*: *yolo* in Aztec means heart and *xóchil* means flower, therefore this flower is good for the heart and, as a matter of fact, its action is similar to that of *digitalis*. The terms of classification used by the Aztecs were so adequate in expressing important characters of certain plants that we find some of these terms in our present botanical nomenclature, as for example the word *Oceloxóchil*, meaning flower of the tigers, is found in the genus *Tigridia*. Their family of *Ayolli* corresponds to our *cucurbitaceae*, which they had divided into two classes, based on the form and quality of the fruits, edible and non-edible. The classification of the family of *Meil* was so well conceived that Linné accepted it practically as it was, giving it the name of *Agaves*. The family of *Ocoil* comprised trees with resinous wood, now the *Coniferae*; one of its subdivisions were the *Liquidambars*, from which they obtained the *Xochiocotzoll*, our present *Styrax*, which they already knew to employ as a perfume, used by the women folk, and incense for their *Teocalli* (places of worship). *Teo* means God and *calli* house.

As we see, the names given by the old Mexican Indians to their medicinal plants were by no means arbitrary, but quite expressive and probably correct in their relation to the plant in the majority of cases. Their language, rich in words and allowing inexhaustible combinations, permitted them with ease to contract several words to one compound word which could express a number of properties.

Many of the Spanish historians of the time of the conquest report that the Aztec doctors possessed a high degree of knowledge of the medicinal flora of their country and used it to make remarkable cures. The origin of this knowledge they trace back to the Toltec race of which P. Sahagún says in his *Historia General de las Cosas de Nueva España* (General History of the affairs of New Spain): "They had much experience and great knowledge, inasmuch as they knew the qualities and virtues of the plants, they were able to distinguish those which were edible from those which were harmful or poisonous and from this knowledge we derived the benefit of knowing to-day how we can alleviate or cure diseases. Their foremost doctors, he continues, were named *Oxomoco*, *Tlaltetecuín*, *Cipactonail* and *Xochicaocaco*; they had an expert knowledge of the plants, they were the first to use them and the first herbalist doctors."

The botanical knowledge acquired by the old Mexicans was the logical consequence of their nomadic life, being continuously in contact with nature, and the necessities of maintenance caused them to investigate and distinguish alimentary plants from those adapted for other purposes.

The plants of the fields they divided into two groups: *Quilil*, which served

as food for men, and *Niazallaqualli*, which were adapted to feed the animals. Then followed other divisions, following quite scientific and practical lines, corresponding more or less to the present families, these again being subdivided in species and varieties.

No doubt the classifications, nomenclature and grouping of the plants by the Aztecs principally according to their properties were the most advanced and superior to that used at that time by the nations of the old world, who knew only two classifications of plants: trees and herbs, arranging them often alphabetically and following more or less the Greek philosophers Theophrastus and Dioscorides, who were the best known botanists of their age. Even though the Aztec classification was far from being perfect, according to our modern ideas, it deserves credit inasmuch as they had devised means by which the various plants were grouped and named methodically without having themselves knowledge of physiology or organography and before there was anything similar available in the old world. We also must give them credit that they have discovered the medicinal value of a goodly number of plants and determined their therapeutic action, discoveries which up to the present day have contributed to the relief or cure of the sick, since many of their medicinal plants are still generally employed in Mexico.

It is only natural to surmise that they conceded also superstitious and illusory virtues to certain medicinal plants, just as is done here and there in these enlightened times with some drugs, for example with *Asa Foetida*, which by burning in the stable is supposed to cure sick cattle by driving out the devil through its bad odor.

I have not investigated which Mexican drugs, used everywhere nowadays, for example, Sarsaparilla, Jalapa, etc., can be traced to the Aztecs. The collection which I am presenting here<sup>1</sup> contains principally such drugs as were used by the Aztecs and which are still in common use in Mexico, but which as far as I know, are not known outside of that country. Many of them have been investigated in the National Medical Institute of Mexico City, where their therapeutic value, originally discovered by the Aztecs, was confirmed in many cases. Practically all of them are enumerated in the "Farmacopea Latino-Americana." I have obtained them mostly fresh from an old Indian woman who specializes in their collection and sale and I have convinced myself that all are genuine by consulting the cited pharmacopœia and investigations in the Biological Museum in Mexico City. Undoubtedly there is still a great field for scientific investigation of these drugs, confirming the therapeutic action claimed for them, finding the most suitable form of administration, finding and separating the active principles, etc. Notwithstanding the fact that the Latin American Pharmacopœia cites a number of native drugs as much used, but having little or no value, it appears to be nevertheless advisable not to take this opinion as final, but to rely on independent investigation, where there is reason to believe that after all the plant *does* have medicinal value. For example I have here a bark which is much used for malaria in certain districts where the tree grows. The Indians powder the dry bark and take of this powder as much as will go on a one *centavo* coin, several times a day. Now, a lawyer in the state of Querétaro having heard not only of the general use of this bark in cases of

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<sup>1</sup> Buffalo A. Ph. A. meeting.

malaria, but also, as he informed me, having been told of many cures, had asked me to prepare 500 tablets from the bark which he furnished, in order to check up their curative action on about two dozen malaria cases. He would not divulge or possibly did not know the name of the bark, which I was able to identify later as Copalchi bark, *Coutarea latifolia* Dec, his intention being to market the tablets, should the sample lot prove to be satisfactory; according to his later advises he had complete success. I was curious, of course, to find out if the bark possibly contained quinine, as it tasted bitter, although it did not look at all like any of the cinchona barks. The analysis, however, proved the absence of quinine. The "Farmacopea Latino-Americana" says of this bark: "Much used but appears to have little effect" and "The bark is sold falsely as cinchona bark." This experience shows that in such cases further investigation is not out of place. The use of Copalchi bark for malaria appears to be of a more recent date and not of Aztec origin.

I desire to mention here that most of my information was gathered from studies in the Biological Museum of Mexico City, from the Latin-American Pharmacopœia and from papers published by Dr. Leopoldo Flores.

In exhibiting this collection<sup>1</sup> I do not endeavor to present it in a certain order but rather at random.

The *Yoloxóchitl*, mentioned before, comes from *Talauma mexicana*, family *Magnoliaceae*, much used at present in nervous affections and heart diseases. The Aztecs used the decoctions of the flower to correct the bowels, to strengthen the heart and as a means against sterility. Its principal chemical constituents are said to be a glucoside and a substance called Talaumine, the latter being a red liquid, forming crystalline salts, for example the sulphate. The Talaumine acts as a paralyzer of the voluntary muscular system, but is said not to affect the heart, whereas the glucoside regulates the heart's action. This drug is claimed to be a substitute for digitalis, but evidently is non-poisonous. Single doses about 20 grains, in decoction, three times a day.

*Copalchi Bark* from *Coutarea latifolia*, family *Rubiaceae*, used for malaria as mentioned before.

*Salvia de Bolita*. *Bolita* in Spanish means little ball, which refers to the flowers. From *Buddleia perfoliata*, family *Loganiaceae*. Its leaves resemble those of our sage and the plant has also a similar aroma. The active constituents are an acid resin and an essential oil. This plant is said to be an excellent antisudorific, it prevents the nightsweats of consumptives in a safe and sure way and without the inconveniences and toxic by-effects of other antisudorifics, as for example the atropine, which is not tolerated well for any length of time. Furthermore the *Salvia de Bolita* inhibits the secretion of nasal catarrh, coryza as well as that produced by alkali iodides. It is also stated to be efficient in combatting the ptyalism during mercurial treatment. Both the essential oil and the tincture are used; ten to thirty drops of the former per day and one fluid drachm doses of the tincture are employed. The plant is non-toxic; its use is apparently not of Aztec origin.

*Cuautecomate*, of Aztec origin, the fruit from *Parmentiera alata*,<sup>2</sup> family *Bigoniaceae*. Contains crescentinic acid and a coloring substance, said to be similar

<sup>1</sup> At Buffalo meeting, A. P. H. A.

<sup>2</sup> Large ostrich-egg-like fruit.

to indigo. Quite frequently used for diseases of the lungs, particularly tuberculosis. Also made into tablets by some pharmaceutical houses. Usually the fresh pulp of this fruit is used.

*Peyote* (Pellote), one of the most interesting of the Mexican drugs, about which an article appeared in the JOURNAL of our society, February number of 1922. Supposed to come from *Lophophora* varieties of the family of Cactus, growing in the valley of the Rio Grande and also from *Lophophora Williamsii* growing in the states of Sonora, Chihuahua and San Luis Potosi. It is a sacred plant of the old Mexicans and was used by them for their religious ceremonies. Its effects resemble those produced by *Cannabis Indica*, but they differ in that the *Cannabis Indica* usually produces sleep after its initial effects are worn off, whereas the *Peyote* does not cause sleep, but on the contrary keeps its users awake and it is stated that by taking the aqueous extract of the *Peyote* every four to five hours the Indians could get along without sleep for as long as eight days and that they do not feel the slightest inconvenience during or after that time. The internal use of this drug in larger doses produces at first a nervous excitement combined with talkativeness and exuberance of brain activity, followed by a period of delirium; however, the effect varies in different persons. During the period of delirium the reflex movements increase, the pupils are much dilated, there is an excessive nasal and auditory sensibility, incoördination, convulsions, dullness of the sensibility of the skin, difficulty of concentrating the attention, hallucinations of the senses, principally the sense of sight and consisting in a play of kaleidoscopic colors continuously in movement, changing their shade with frequency and showing either linear, rotatory or circular movements while the eyes are usually closed. Colored objects are seen with much more intense colors than they actually possess. The intelligence remains usually in a normal condition. Sometimes a sensation of double existence is noted. If a fatal dose has been taken, a complete paralysis sets in and death is induced by asphyxia. It is said the *Peyote* user does not feel hunger or thirst and is capable of great physical performances, without getting tired; he is said to be able to dance all day and night during the religious ceremonies in which the partaking of the *Peyote* is the chief factor. If these statements are not illusions, the *Peyote* surely is a most remarkable plant. Mr. E. White of the hospital in Saint Thomas succeeded in separating four alkaloids from the *peyote*: Mescalina, Anhaloidina, Anhalonina and Lofoforina. Dr. W. E. Dixon of the same hospital studied the pharmacology of these alkaloids and found that they at first produce stimulation of the heart's action followed by a lessening of its contractions, increase of arterial tension, stimulation of the activity of the brain and the nervous center. The drug has been used in the form of hypodermic injections in cases of lunacy, as a sedative, with partially good results. It also has been given in the form of tincture and its fluidextract; its medical use is evidently very limited on account of its dangerous character. There is, however, another use made of this drug as the old Indian woman from whom I obtained it informed me: "*Las señoras lo compran para limitar la familia*," translated: the ladies are buying it to limit their families; in other words *Peyote* acts also as an abortive.

*Epazotl*, an Aztec word, meaning painful herb, from *Chenopodium foetidum*, contains a volatile oil, resin and an alkaloid. The volatile oil has a very pungent and bitter taste, which seems to account for its name, "painful herb." Used by

the lay people as emmenagogue and anthelmintic, also as a sudorific and diuretic. The anthelmintic action of the oil has been confirmed and is said to be superior to that of santonine, but probably has no advantage over our oil of chenopodium. The action of the plant as emmenagogue, sudorific and diuretic has not been confirmed.

*Palo del Muerto*, in Spanish, and means: Wood of the dead. From *Ipomœa arborea*, vulgarly employed in alcoholic extraction in the form of rubs for rheumatism. The Latin-American Pharmacopœia says this of wood that it is inert and not used, probably meaning, not used by the medical profession.

*Espinosa*, from *Loeselia coccinea*. Espinosa in Spanish means spiny, thorny. This drug is now known under the name of *Espinosa* and for plausible reasons not by its Aztec name *Huitzitzitxóchitl*. Contains traces of volatile oil, several resins, tannin, an alkaloid and saponine. Used as a purgative and an emetic. Fifteen grains of the powdered root or sprout are said to produce vomiting within 5 minutes. Also used against falling out of the hair, probably on account of its saponine content.

*Hierba de la Golondrina*, from *Euphorbia prostrata*. When fresh it contains a white juice. Used among lay people for many diseases of the skin, but its therapeutic value has not been confirmed.

*Hierba del Pollo*, chicken herb, from *Commelina pallida*. The Aztecs called it Matlaliztic and used it against post-puerperal pains and hæmorrhages. Contains resin, gum, tannin, etc. Its hemostatic action in metrorrhagia has been confirmed, also its efficiency in leucorrhœa. It is also said to exert a beneficent action on hemorrhoids when applied locally, and has no toxic effect; is used in form of its extract, but principally the fresh juice of the plant.

*Lentejilla*, probably not of Aztec origin. Its botanical name is *Lepidium intermedium* and as readily can be seen a *Crucifera*. Contains volatile oil, an alcohol soluble acid resin, an alkaloid, tannin and a not determined organic acid. The plant is used with good results in acute and chronic enteritis as a clyster, 5% decoction of the fresh plant or 1% of the fluidextract. The plant is non-toxic.

*Tatalencho*, the Aztec *Xonequitile*, from *Gymnosperma multiflorum*, a member of the *Compositae*. Contains volatile oil, resin, an organic acid, etc. Its tincture in local application has given satisfactory results in alleviating rheumatic pains. A 10% decoction is stated to be a good antidiarrhoeal remedy.

*Tronadora*, *Nixtamalxóchitl* in Aztec, contains an alkaloid, resin, tannin, pectin substances, etc. The leaves are used by the public in the treatment of diabetes and the plant enjoys the reputation to cure or at least improve this affliction. According to the Latin-American Pharmacopœia authoritative observations concede a certain usefulness to the *Tronadora* in the treatment of diabetes. The plant has no toxic effect.

*Zoapalle*, known to the Aztecs under that name, which means medicine for the women; the botanical name is *Montanoa tomentosa*, family *Compositae*. The old Mexicans employed the leaves of this plant as a decoction to induce uterine contractions. The active principle is the so-called montanoic acid, an amorphous substance. This plant is a powerful oxytocic and its action comparable to that of ergot. When taken indiscriminately in large doses, it produces symptoms of poisoning and may even be fatal. It is indicated in the same cases as ergot; also after

parturition with good results to combat haemorrhages, to alleviate after-pains, etc. Used in 2% infusion or in the form of its fluidextract.

*Tlalchichinole*, also in use since Aztec times; botanical name is *Isoloma Deppeanum*; contains enzymes, volatile fatty acids, tannin, volatile oil, etc. This plant is to be found in many households as a first aid remedy and employed in various inflammatory conditions, principally in diseases of the female sex.

*Simonillo*, in Aztec called *Zacachichic*, meaning bitter herb. From *Conyza flaginoides*; employed by the old Mexicans as an emetic and cholagogue, also as a carminative, furthermore in dyspepsia and to alleviate cough. It contains a bitter glucoside, volatile oil, etc. Investigations have shown that the drug gives good results in counteracting catarrh of the bile ducts, it acts favorably in jaundice and is a noteworthy cholagogue. It is used either in decoction or as extract in pills.

*Tabaquillo*, from *Calamintha macrostema*, *Labiatae*. The leaves have an aromatic taste and are used for gastro-intestinal troubles. They contain a volatile oil which is claimed to be a good substitute for oil of peppermint, and is indicated for the same purpose as our peppermint. The use of this plant appears to be of a more recent date.

*Toronjil*, from *Cedronella Mexicana*, *Labiatae*, also very aromatic and contains a volatile oil. The plant is used as a substitute for balm leaves and it is said to possess the same effect.

*Tumba Vaqueros*, called *Tlaxcapan* in Aztec. The rhizome of *Ipomœa stans*. Used since times immemorial as a purgative by the Indians, also for hysteria and epilepsy. Contains a glucoside, resin, catechin, etc. Hospital experiments have not confirmed the purgative properties of this drug, which appears rather strange after being in use for centuries, and a self-deception on the part of the Indians as to the effect of the drug don't seem to be very likely for such a long time. In hysteria and convulsions the action of the dug is stated to have been more satisfactory.

*Pinguica*, or in the Aztec idiom *Tepizquill*, the fruit of *Arctostaphylos pungens*, used already by the old Mexicans as a diuretic. The constituents are: fatty oil, a yellow coloring substance, considerable citric acid, resin, sugar, etc. No arbutine has been found. Clinical observations have confirmed the diuretic properties of these fruits. They are non-toxic and are employed as decoction and fluidextract.

*Estafiate* from *Artemisia Mexicana*, called *Iztauhyaatl* in Aztec. This plant may become an important raw material for the manufacture of Santonine, which it contains in the proportion of about 1.2% according to investigations of the Biological Institute of Mexico City, and I believe also by the Department of Agriculture in Washington. The plant is used as an anthelmintic.

*Raíz de Pyonia*, also called *Tulillo*, from *Cyperus esculentus*, *Cyperaceae*. The natives use the decoction of one of the roots, taken internally, to alleviate neuralgic pains.

*Capitaneja*, from *Verbesina Capitaneja*, *Compositae*. It is much employed as a hair tonic in alcoholic extractions.

This fruit is called *Guázuma* and is used in cases of leucorrhœa and also for cough. From *Guázuma polybotrya*.

*Ojo de Venado*, Spanish and stands for "Stag or deer eye" on account of the resemblance. The seeds of *Mucuna urens* have some similarity with Calabar beans and are used by the superstitious natives as an amulet, worn around the neck,

as a preventative against nervous afflictions of the face, particularly neuralgia.

It is quite natural that the various countries prefer to employ those vegetable drugs which they can grow themselves and that they use foreign drugs only when nothing equally good is available among their own. The pharmacopœias of the different countries evidently have the same point of view. It is to be assumed that many of the native Mexican drugs shown here have no superiority over similar drugs of other countries, but just as well it may be that some do have decided advantages over those used at present or possibly the one or the other may not be represented at all by any other doing the same work. The Yohimbi bark, for example, was first introduced in Europe in the year 1896, but was long known and used by the natives of Africa.

In order to arrive at the truth one should also consider the opinions obtained through traditions.

CAPPUS LABORATORIES, RESEARCH DEPARTMENT,  
MAMARONECK, N. Y.

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## FATAL POISONING CASES IN HENNEPIN COUNTY, MINNESOTA, DURING 1923 AND 1924.\*

BY F. J. WULLING.<sup>1</sup>

I can never get away from the almost overwhelming feeling of responsibility of the calling of pharmacy. When we handle poisons, we are always faced with the possibility of mistake and the dire consequences that may follow. When we look into the public records, we find a corroboration of the need of extreme care in the handling of drugs and poisons.

I am not as successful as I want to be with the students in imbuing them with the great responsibility of the calling. We, and other colleges, teach them every possible method of preventing error; yet errors are occurring—some of them fatal.

The Commonwealth Fund of New York is conducting a study of pharmacy, "in order to find out what is necessary for the pharmacist to know." I am quoting those words. For many years pharmacists have endeavored to enlist the Carnegie Foundation in a survey of the schools of pharmacy and the practice of pharmacy, very much as it did with reference to medicine by virtue of which an increase in medical standards followed. The Carnegie Foundation felt it could not conduct such a survey at the present time. So the Commonwealth Fund of New York finally thought it would be a proper function for it to enter upon a study of the practice of pharmacy to enable the schools and the practitioners to revise, possibly, their educational and practical methods.

So Professor Charters of the University of Pittsburgh was enlisted to direct the study. The Foundation will spend, I understand, about \$25,000 on the study. A hundred thousand prescriptions are being studied to enable pharmaceutical educators and practitioners to come to some conclusion as to the amount and nature of study that should be required of prospective pharmacists.

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\* Read at the joint meeting of the Northwestern Branch, A. Ph. A., and the Scientific and Practical Pharmacy Section of Minnesota State Pharmaceutical Association, February 11, 1925.

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