HENNA LEAVES AND POWDER FROM LAWSONIA ALBA.*

By DR. HEINRICH PASCHKIS.

UNDER the name "henna al henna" ("chenna") a powder is used by Persians, Arabs, and Egyptians, as a cosmetic, which I have submitted to a close investigation.

For this purpose I used three specimens, one of which had been for a long time in the Pharmacological Institute of Vienna; another had been recently sent there by Dr. Polak; the third was kindly furnished to me by Professor Dr. J. Neumann (the last was obtained from the Persian Embassy). All three specimens corresponded with one another both in appearance and microscopical features. The henna powder is greenish brown, tolerably uniform, feeling somewhat sandy between the fingers. In the glass vessels in which it has been preserved for a long time it has acquired upon the surface, under the influence of light, a reddish tinge. Microscopically examined it was recognized as a powder of *Lawsonia* leaves rendered somewhat impure by foraminiferous sand. The general elementary forms which are described subsequently, as well as entire leaves and abundant crystals of oxalate of lime, were also found in it.

Of the leaves themselves I have had two kinds before me, one coming from Persia, the other from the French colony of Senegal; the former was placed at my disposal by Herr Prof. Vogl, the latter by Dr. Moeller. The Persian leaves correspond with two herbarium specimens of *Lawsonia alba*, Lam. (*L. spinosa* and *L. inermis*, Linn.) in the Pharmacological Institute in Vienna, and with those of *L. spinosa*, except some variation in the size. The Senegal leaves are only distinguishable from the others by being larger (1 to 2 centimeters longer). The Persian leaves are ovate, acute, mucronate, disappearing at the base into the short petiole. In length they attain 2 centimeters; their greatest breadth is 1 centimeter. The margin is entire, somewhat revolute. The coriaceous shining upper surface is greenish-brown; the under side is rather lighter colored. There is one principal nerve, the lateral nerves anastomosing not far from the margin.

The epidermis of the upper side consists of polygonal cells, crowded together, leaving between them an extraordinary number of stomata. Among the epidermis cells occur, in tolerable abundance, but irregularly distributed, single cells which are remarkable on account of their size (0.033 mm. by 0.018) and the strongly refracting property of their contents (mucilage). These appear equally striking in a transverse section of the leaf. The mesophyll consists under the upper surface of a double palisade layer, and

FIG. 1.—LAWSONIA ALBA—TRANSVERSE SECTION.

FIG. 2.—UPPER SURFACE.

below that of cells containing chlorophyll crowded together. (Figs. 1 and 2). Among these cells occur numerous rosettes of oxalate of lime. The epidermis of the under side scarcely differs from that of the upper; an almost equal number of stomata occur in it. In solution of potash a section assumes uniformly a beautiful yellow color. Chloride of iron reveals in the mesophyll a tannin turning green with salts of iron; the epidermis cells also, with the exception of the before-mentioned protoplasm cells, easily turn green. The microscopic sugar test gives a negative result; as also treating with chloride of zinc, which only colors the epidermis violet. Leaves kept a long time in alcohol became a somewhat pale reddish color; under the microscope, sections treated with potash solution appeared of a very beautiful delicate rose color. The Senegal leaves scarcely differed in structure from the others.

For the purpose of chemical investigation, 50 grammes of the powder were digested with 1 liter of water, filtered, and the filtrate evaporated to dryness, forming a dry extract, dark brown in color, bitter tasting, and smelling of caramel; a specimen gave sugar when tested. A very small portion of the extract was soluble in alcohol with a yellow-brown color. In ammonia the greater part was soluble, with a beautiful Malaga brown color.

The residue from the treatment with water was digested with 96 per cent. alcohol, filtered, the filtrate concentrated by distillation, again filtered (the residue consisting of black viscid drops, containing wax and chlorophyll), and then evaporated in the air. The supernatant water was poured off. The fine granular wood-brown residue was afterwards dissolved in hot alcohol; after cooling, and remaining some time another small quantity of odorless and tasteless dark brown residue remained, which behaved as described of the last residue. The last alcoholic solution gave upon evaporation a brown resinous mass, which in a suitable quantity of alcohol was soluble with a golden brown color, and could be diluted with water, showing a slight turbidity. It was decolorized by hydrochloric or nitric acid, and became a very deep brown color with solution of ammonia or soda. This substance was further scarcely soluble in cold water, and only to a small extent in hot water (the dirty yellow turbid solution being colored blackish-green with chloride of iron). In benzene, carbon bisulphide, amyl alcohol, ether, and chloroform it was partially soluble, and in petroleum spirit and turpentine almost insoluble. The alcoholic solution, diluted with water, gave the following reactions: With hydrochloric acid, an opalescent turbidity,

nitric acid, a yellowish turbidity; chromic acid, a dirty yellow-brown turbidity; caustic soda or ammonia solution, a clear dark Malaga brown; stannic chloride, dirty greenish-yellow rusty brown flocculent precipitate; solution of alum, a dirty yellow turbidity; chloride of iron, dark greenish brown; lime water, turmeric yellow, with a slight brownish precipitate; chloride of lime, light yellow, with a slight brownish precipitate; cyanide of potassium, citron yellow, clear; acetate of copper, sea-green, with a slight red-brown precipitate.

This last resinous mass and the above-mentioned residue were washed frequently with hot water, and then completely dissolved in boiling ether. Upon the evaporation of the ether there was obtained a very acrid mixture of two resins; one an acrid soft resin; the other a hard resin, appearing under the microscope in turmeric-yellow scales. The wash-water, which was of a beautiful flesh red color, contained tannin (colored green with chloride of iron) and coloring matter (becoming intensely brown with ammonia or soda solution), the separation of which in such small quantity was impracticable.

In a second experiment 25 grammes of coarsely powdered leaves were mixed with caustic lime—upon which they gave off a very disagreeable odor resembling trimethylamine—and dried. The product was digested with alcohol, filtered, the lime precipitated with sulphuric acid, the liquid concentrated by distillation, again filtered and soda solution added to an alkaline reaction. A slight turbidity resulted, and as the liquid did not clear, it was shaken with amyl alcohol, and the greenish-yellow solution in amyl alcohol evaporated. Placed in a watch glass there shot out some very delicate tufts and needles of brownish-yellow crystals, which dissolved in water and separated again from the aqueous solution in the same form. These crystals were evidently only sodium salts, which separated out from the water removed with the amyl alcohol.

Lastly, 100 grammes of powder* were digested with potash solution and water with heat and the infusion distilled. The water clear distillate showed distinctly an alkaline reaction and had a very disagreeable smell. It was reduced to one-half by redistillation and the resulting strongly alkaline liquid was treated with dilute sulphuric acid and evaporated upon a water-bath. The liquid, at first water clear and colorless, assumed, upon warming, a tint of rose red, and at the close was of a brownish color; but at this temperature it could not be brought to dryness. Upon the advice of Professor Schneider, the small quantity of liquid was neutralized with potash solution, which caused considerable effervescence; there was given off, at first, an indefinite disagreeable (aromatic) odor, and then a clearly ammoniacal pungent vapor, having a strongly alkaline reaction. The liquid, diluted with distilled water, was now again submitted to distillation; and the vapor conducted into a well-cooled receiver moistened with hydrochloric acid. A dense white mist was developed. The distillate was then evaporated at a very low temperature upon a water-bath, when there resulted a white deliquescent, faintly ammoniacal smelling salt. A portion was dissolved in a very small quantity of absolute alcohol, which upon evaporation left it as a white deliquescent salt similar to that previously obtained. A portion of this latter product treated with solution of potash gave off at first a penetrating fishy smell, which was very similar to that of trimethylamine, gradually passing into a pure ammoniacal odor. The solution with caustic potash became, after standing a few minutes, a delicate rose color. These phenomena, I think, I may refer to a volatile, easily decomposable amine base, if not directly to trimethylamine. The preparation of it in a pure state and in sufficient quantity and its analysis being impracticable with the small quantity of material at my disposal, I reserve its further investigation until subsequently.

Henna has been in use among orientals from the most ancient times until the present day for coloring the finger nails, the soles of the feet, and palm of the hands; also the points of the beard, and the hair. As to the method of producing the dye statements differ. According to a communication made to me orally the powder is stirred with water to make a paste, and this is spread directly upon the place to be colored, which is thus tinged orange-red. Experiments that I have made upon myself lead me to doubt the activity of a paste so prepared. My finger was only soiled, but not colored. With some alkali, however, I obtained, not a yellow or a red, but a brownish color, which corresponded with my experiments. In the dyeing of hair black, the henna should be used in combination with indigo, an innocent, if not very handsome, dyeing material.

Finally, it may be mentioned that in the East the ends of the manes and tails of old horses are colored red with henna. Besides this, henna is used in India as "mayndie," in the dyeing of leather, and in recent times, in France, for the dyeing of silk.† Further, the root is used in pharmacy, as "red alkanna," for coloring ointments and pomades.

The earliest and at the same time, clearest notice of the use of henna I find in Prosper Alpinus,‡ who, under the designation, "Ligustrum Egyptium, Elhane vel Tamarhendi," gives a very good figure and description of the plant. He says, "They make from the leaves a powder which is called 'archenda.' This the women use as a beautifying material, by staining their hands and feet with it of a golden yellow color. Not by mixing with the juice of Lanaria or of Struthium, but simply with water, they produce a golden yellow water which dyes the same color. If our women had used this substance for rendering their hair golden (*pro de aurandis capillis*), which might be used without injury, they would not have allowed their heads to be singed by the sunbeams and injured in every possible way." According to him, also, the powder is used for sweaty feet, and for ulcers of the mouth, gums, and genitals, and the flowers are used as a remedy against headache. Similar statements occur in Loureiro§ and in Vitzel||. Finally, in a more recent work¶ I have found statements that correspond with those of old Alpinus. In India the plant is used as a remedy against all possible diseases and also as a dye material. For this latter purpose the powdered leaf is made into a paste with catechu.**

* This quantity was supplied to me by the kindness of Dr. A. Braun. The microscope showed in this, as in all the other powders, an enormous admixture of sand. A preliminary incineration gave more than half (62 per cent.) of incumbustible residue.

† Wiesner, "Rohstoffe des Pflanzenreichs," p. 674.

‡ "Historia Egypti Naturalis," written in 1592, pub. Ludg. Batav., 1735, Pars. ii., De Plantis Egypti, p. 23, cap. xiii.

§ Loureiro, "Flora Cochinchinensis," Berlin, 1793, p. 281.

|| Vitzel, "Icones Plantarum," Vienna, 1818, vol. vii., p. 70.

¶ Drury, "Useful Plants of India," p. 285.

** Dymock, "Notes on Indian Drugs," Pharm. Journ. [3], vol. ix., p. 894. After an historical notice which goes back to Solomon, Dymock gives also a notice upon the uses, which corresponds with the above. Synonyms: Mehndee (Hind. and Bomb.); Marutouri, Aivanam (Tam.); Mehedi (Beng.)

RAPID DETECTION OF THE PRESENCE OF WATER IN ALCOHOL AND ETHER.

By CARL MANN.

IF an aqueous solution of 2 parts crystalline tartaric acid is mixed with 1 part of molybdic acid and evaporated to incipient fusion in a porcelain capsule, the deep blue mass which is formed, if heated with 30 to 40 parts of water, yields along with a fixed residue a faint yellowish brown filtrate, holding in solution the citrate of a molybdenum compound, which has the property of appearing deep blue in its anhydrous state, but almost colorless when hydrated. If a slip of filter-paper is steeped in this molybdenic solution (not too dilute) and dried at 100° the blue color reappears with great intensity. The paper, if screened from direct sunlight, retains its color. If it is plunged in pure water the blue color disappears at once, the paper becomes white, and the water is not colored. At 50° the decoloration is instantaneous; at 18° to 20° in two or three seconds, and at 10° in five to eight. With absolute alcohol or ether in a stoppered bottle the blue color of the paper remains unaffected. This reagent for water is not acted on by acetone, aldehyd, methyl alcohol and mixtures of amyl and ethyl alcohol. If plunged in spirit of wine the blue color disappears more rapidly the more water is present.

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