cated but traces of them. Due to the small amount of the oil on hand and its pronounced sassafras odor it was decided to forego the determination of any more chemical and physical constants and utilize the entire amount for the determination of the chief constituent.

Separation of Safrol.—8.7 Gm. of the oil were chilled in a mixture of ice and salt to −11° C. No solidification took place even though the melting point of safrol is +8° C. Neither would a commercial sample solidify at this temperature which bore out statements in the literature that a temperature of −12° C. is necessary to solidify safrol. The oil was transferred to a centrifuge test-tube and frozen by dry ice. It was then placed in an ice-bath at 0° C. and kept there for one hour, after which it was briefly centrifuged at 1500 r. p. m. The separated liquid was poured off. It amounted to but five drops and had an odor remindful of nutmeg. An effort to prepare a solid bromine derivative of it failed.

Identification of Safrol.—The tube of crystals was immersed in a water-bath held at 11° C. They slowly melted. To determine the melting point a corrected Anschutz thermometer was immersed in the liquid and frozen there by dry ice. The tube was transferred to a water-bath held at 13° C. and the melting point observed to be 7–8° C. This was checked twice. The melting point of safrol was recorded by Eykman (2) as being 8° C. Refractive index at 20° C. was found to be 1.5340. That reported by Schimmel and Co. (3) for safrol is 1.5377 at 20° C. Using a 2.5 cc. weighing tube $d_{\frac{15}{15}}$ was 1.089 as compared to Eykman (2) 1.0960. Safrol was further identified by oxidation with an alkaline potassium permanganate solution which gave the piperonylic acid described by Fittig and Mielch (4). This oxidation must be carefully controlled because of the variety of products obtainable. Repeated trials were first made on commercial safrol. The following procedure was then adopted. Disperse 4 cc. of the sample in 240 cc. of a 1% sodium hydroxide solution contained in an 800-cc. flask. To this is slowly added with agitation 200 cc. of 5% potassium permanganate solution. Heat on a water-bath for one hour. Filter hot and cool. Acidify the filtrate with sulfuric acid. The precipitated piperonylic acid is filtered off, washed with water and recrystallized from hot alcohol. It melts at 228° C.

SUMMARY.

1. The volatile oil of *Illicium parviflorum Michx.* is largely safrol estimated at more than 90%.

2. This oil has the highest safrol content of any volatile oil yet reported.

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NOTES ON THE STABILITIES OF ATROPINE AND HYOSCYAMINE IN SOLUTION.*

BY H. H. FRICKE[1] AND K. L. KAUFMAN.[2]

The variable amounts of alkaloids obtained in the assays of the Solanaceæ drugs have been the cause of much study of the various processes. Several factors may explain the variations in the amount of alkaloids isolated. One may be the instability of atropine and hyoscyamine when heated in the various solvents. Another factor is the presence of amines and ammonia in the drugs.

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Dietzel, Schlemmer and Fischer (1) found that aqueous solutions of scopolamine, hyoscyamine and atropine showed definite changes in spectra after one hour of steam sterilization. The changes were attributed to the formation of tropic acid. However, Bjerregarrd and Schou (2) found that solutions of atropine may be sterilized 20 minutes at 120° C. without appreciable decomposition. This was not true, however, if a buffer of p_H 6.0 or higher was added.

Schaller and Baldinger (3) reported that assays completed by using a vacuum desiccator instead of a water-bath to evaporate the volatile solvents gave much higher results. DeKay and Jordan (4) found that the alkaloids of hyoscyamus were very stable and underwent no change during the assay process, that they could be heated two hours without danger of decomposition and that no hydrochlorides were formed when chloroform solutions containing them were evaporated to dryness.

Watkins and Palkins (5) found that certain brands of chloroform reacted with atropine and hyoscyamine to a considerable extent. Scoville (6) also has mentioned this tendency. As a remedy, it has been suggested to add a few cc. of dehydrated alcohol before the last few cc. of chloroform have been evaporated.

Ewe (7) felt that no notice was taken of the hydrolyzing effect upon the hyoscyamus alkaloids of the moisture which may be present in the solution. He found this must be considered and the amines must be volatilized, but that the temperature must be closely watched. He suggested removing the last two cc. of chloroform at 40° C. with a current of dried air.

EXPERIMENTAL.

The following experiments were made to determine what changes pure hyoscyamine and atropine undergo in solutions of chloroform or ether. Not less than four titrations were made in determining each average.

Six-tenths (0.6000) gram of the alkaloid was dissolved in 500 cc. of solvent. Twenty-five-cc. portions of this were evaporated on a water-bath and heated for various periods. The treatments and results are summarized in the following table.

TABLE I.

Alkaloid.	Solvent.	Quality of Solvent.	Water-Bath Treatment.	Aver. Per Cent Sample Returned.*
Atropine	Ether	U. S. P.	Evap. to dryness	100.00
"	"	"	Heated 30 min. after evap'n.	95.80
"	"	"	Heated 60 min. after evap'n.	95.23
Hyoscyamine	"	"	Evap. to dryness	100.00
"	"	"	Heated 30 min. after evap'n.	99.60
"	"	"	Heated 60 min. after evap'n.	98.86
"	"	"	Heated 120 min. after evap'n.	97.56
Atropine	"	U. S. P. Dry**	Evap. to dryness	100.00
"	"	" "	Heated 30 min. after evap'n.	95.80
"	"	" "	Heated 60 min. after evap'n.	95.30
Hyoscyamine	"	" "	Evap. to dryness	100.00
"	"	" "	Heated 30 min. after evap'n.	99.68
"	"	" "	Heated 60 min. after evap'n.	98.86
"	"	" "	Heated 120 min. after evap'n.	97.92
Atropine	Chloroform	Tech.	Evap. to dryness	87.40
"	"	"	Heated 30 min. after evap'n.	80.06
"	"	"	Heated 60 min. after evap'n.	77.10

TABLE I.—(*Continued from page 575*).

Hyoscyamine	"	"		Evap. to dryness	93.04
"	"	"		Heated 30 min. after evap'n.	92.29
"	"	"		Heated 60 min. after evap'n.	87.60
"	"	"		Heated 120 min. after evap'n.	83.45
Atropine	"	"	Dry**	Evap. to dryness	93.01
"	"	"	"	Heated 30 min. after evap'n.	93.00
"	"	"	"	Heated 180 min. after evap'n.	83.09
Hyoscyamine	"	"	"	Evap. to dryness	97.39
"	"	"	"	Heated 30 min. after evap'n.	94.38
"	"	"	"	Heated 60 min. after evap'n.	91.92
"	"	"	"	Heated 120 min. after evap'n.	90.22

* Calculations based on largest amount returned (0.03127 Gm.) as 100%.

** Dried over calcium chloride.

SUMMARY AND CONCLUSIONS.

1. Hyoscyamine and atropine are more stable in ether than in chloroform solutions.

2. Continued heating of these alkaloids on a water-bath causes their partial disappearance. This confirms the work of Schaller and Baldinger, Ewe and Scoville.

3. The results obtained show that heat is definitely a factor in the disappearance of the alkaloids from their ether solutions.

4. When chloroform is used as the solvent, some other form of destruction must also occur, as the dried chloroform gives higher results than the U. S. P. grade.

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DIAZO COLOR REACTIONS.*

BY KIRBY E. JACKSON AND WILLIAM M. DEHN.

This reaction, commonly named Ehrlich's diazo reaction, has been used to detect bile pigments in blood or in urine; also, ureoresin, urochromogen (1) and an unknown compound found in urine in cases of typhoid and measles (2). It is known that administered alcohol (3), phenols and opium bases (4) and other drugs (5) give positive Ehrlich's test with urine. It seemed important to investigate a range of other medicinals to ascertain possible fallacies when this test is applied for clinical purposes.

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