Haley[11] who described an inactivation of castor bean lipase while in contact with water.

Summary

Dormant cottonseeds contain no lipase. Lipolytic activity develops during germination. Concurrently, total lipids decrease and free fatty acids increase. The germinated cottonseed lipase is effective in the *p*H range 6 to 9 (optimum 7 to 8). Calcium chloride activates the enzyme, particularly in alkaline solutions. The effects of several other reagents on its activity are described.

PITTSBURGH, PA.

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(11) H. E. Longenecker and D. E. Haley, THIS JOURNAL, **59**, 2156 (1937).

[CONTRIBUTION FROM THE INSTITUTE OF MATERIA MEDICA, SHANGHAI]

Study of Gelsemine. II. The Bromination and Nitration of Gelsemine

BY T. Q. CHOU AND T. T. CHU

In a previous paper,[1] the reduction of gelsemine to dihydrogelsemine, isogelsemine, and a crystalline substance having the composition $C_{18}H_{22}O_4N$, was reported. The ease with which gelsemine forms new bases by taking up one molecule of water or hydrogen chloride,[2] indicates probably the presence in its molecule of a double bond which is more highly reactive than the double linkages of a benzene ring. The fact that gelsemine readily forms an addition product with bromine appears to support this view. Dibromogelsemine, $C_{20}H_{22}O_2N_2Br_2$, is obtained when gelsemine is allowed to react with two atoms of bromine at a low temperature. It is sufficiently stable to be isolated and purified, but loses easily one molecule of hydrogen bromide to form monobromogelsemine, $C_{20}H_{21}O_2N_2Br$, when treated with acids and alkalies. The nitration of gelsemine with a mixture of concentrated nitric and sulfuric acids at −7° did not lead to satisfactory results as the products were amorphous, without definite melting points and difficult to be purified. On the contrary, dihydrogelsemine, when nitrated under similar conditions, gives rise to dinitrogelsemine, $C_{20}H_{22}O_6N_4$, with an almost quantitative yield. It forms well crystallized nitrate and methiodide.

Experimental

I. **Dibromogelsemine.**—To 1 g. of gelsemine (acetone-free) in 25 cc. of chloroform cooled in a freezing mixture 0.5 g. of bromine (2 atoms) in 5 cc. of chloroform is slowly added with stirring. The addition product, which separates out at first, redissolves on shaking. After about one hour in the freezing mixture, the slightly pink chloroform solution is distilled and the residue taken up with alcohol whereupon dibromogelsemine crystallizes in colorless rhomboidal crystals. Dibromogelsemine in a pure state is only sparingly soluble in most organic solvents such as ether, benzene, chloroform, methanol, ethanol, carbon tetrachloride, and ethyl acetate. When carbon tetrachloride is substituted for chloroform as the solvent for bromination, the same result is obtained.

II. **Monobromogelsemine.**—A solution of 0.5 g. of dibromogelsemine in dilute oxalic acid, is made alkaline with sodium carbonate, and the precipitate extracted with chloroform. The chloroform solution is dried with anhydrous sodium sulfate and distilled to a small volume. Ether is then cautiously added until a turbidity begins to appear. On standing overnight at room temperature, monobromogelsemine crystallizes out in colorless prisms. It is easily soluble in chloroform or ethanol and much less so in ether.

III. **Dinitrogelsemine.**—One gram of powdered dihydrogelsemine is slowly added with stirring to a mixture of 8 cc. of sulfuric acid (sp. gr. 1.84) and 1 cc. of nitric acid (sp. gr. 1.42) which is maintained at −7° in a freezing mixture. At the end of the reaction, the temperature is allowed to rise gradually and remain at 5° for about ten minutes. A clear orange solution thus obtained is poured into a sufficient quantity of a mixture of ice and water, made alkaline with potassium carbonate, and the precipitate extracted with chloroform. The chloroform solution is dried with anhydrous sodium sulfate and concentrated until fine yellow needles separate out. Recrystallized from a mixture of chloroform and absolute alcohol, dinitrogelsemine forms bright yellow, long, soft needles. The yield is almost quantitative. It is dextrorotatory, $[\alpha]^{18}\text{D}$ +6.6°. Dinitrogelsemine is found to be easily soluble in chloroform and pyridine, less so in acetone, methanol, ethanol, benzene, and ether and insoluble in petroleum ether. It is slightly soluble in water and its aqueous solution has a neutral reaction toward litmus paper. It is soluble in concentrated sulfuric acid to form a light yellow solution which becomes green on the addition of a crystal of potassium dichromate. The acetone solution of dinitrogelsemine becomes cherry red and then blood red on the addition of a few drops of 10% potassium hydroxide solution—Janovsky's reaction for aromatic polynitro compounds. When hydrogenated in the presence of Adams platinum catalyst, it takes up six moles of hydrogen, but

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(1) Chu and Chou, THIS JOURNAL, **62**, 1955 (1940).

(2) Moore, *J. Chem. Soc.*, **99**, 1231 (1911).

TABLE I

ANALYTICAL RESULTS OF THE COMPOUNDS DESCRIBED IN THIS PAPER

Name	Formula	M. p., °C.	Carbon, % Calcd.	Carbon, % Found		Hydrogen, % Calcd.	Hydrogen, % Found		Nitrogen, % Calcd.	Nitrogen, % Found		Bromine, % Calcd.	Bromine, % Found
Dibromogelsemine	$C_{20}H_{22}O_2N_2Br_2$	309 (dec.)	49.79	49.59	49.71	4.56	4.85	4.78	5.81	5.90	5.72	33.19	32.74
Monobromogelsemine	$C_{20}H_{21}O_2N_2Br$	>320	59.85	59.63	59.56	5.24	5.41	5.60	6.98	7.05	7.10	19.95	19.98
Dinitrogelsemine	$C_{20}H_{22}O_6N_4$	257–258 (dec.)	57.97	57.75	57.95	5.31	5.44	5.62	13.52	13.64	13.52	...	...
Nitrate	$C_{20}H_{22}O_6N_4 \cdot HNO_3$	219–221 (dec.)	50.31	50.30	50.33	4.82	4.89	4.92	14.67	14.50	14.83	...	...
Methiodide	$C_{20}H_{22}O_6N_4 \cdot CH_3I$	255–256	45.33	45.10		4.50	4.70		10.00	10.12	10.23	...	...

the resulting product is very readily resinified even in a carbon dioxide atmosphere.

Nitrate.—This is obtained by neutralizing the base suspended in water with dilute nitric acid (1:4). Recrystallized from methanol, the nitrate is obtained as yellowish rhombic prisms. It is levorotatory in methanol, $[\alpha]^{22}D$ −61.7°, and its aqueous solution has a weak acidic reaction toward litmus paper.

Methiodide.—A mixture of 200 mg. of the base, 15 cc. of methanol and 1 cc. of methyl iodide is refluxed on a water-bath for twenty minutes. The resulting clear solution is concentrated and allowed to stand overnight in a cold, dark place. The methiodide crystallizes out as fine yellow needles, which are fairly soluble in water. It is levorotatory in methanol, $[\alpha]^{18}D$ −68.5°.

Summary

Gelsemine forms easily an addition product with bromine. Dibromogelsemine, $C_{20}H_{22}O_2N_2Br_2$, thus prepared, is sufficiently stable to be isolated and purified, but loses easily one molecule of hydrogen bromide to form monobromogelsemine $C_{20}H_{21}O_2N_2Br$.

The nitration of dihydrogelsemine results in the formation of dinitrogelsemine, $C_{20}H_{22}O_6N_4$, with an almost quantitative yield. Its nitrate and methiodide have been prepared.

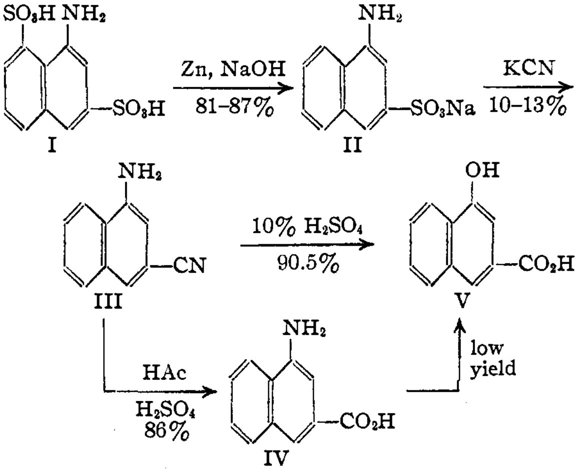
SHANGHAI, CHINA RECEIVED JANUARY 6, 1941

[CONTRIBUTION FROM THE CHEMICAL LABORATORY OF HARVARD UNIVERSITY AND THE DEPARTMENT OF CHEMISTRY, DEPAUW UNIVERSITY]

A Convenient Method for the Preparation of Hydroxy Naphthoic Acids

BY JAMES CASON

The initial objective of this work was to prepare 4-hydroxy-2-naphthoic acid, required for the synthesis of 3,7-dimethoxy-1,2,5,6-dibenzanthraquinone.[1] Butler and Royle[2] have reported the preparation of this acid by distillation of the sodium salt of 4-naphthylamine-2-sulfonic acid with potassium ferrocyanide, hydrolysis of the resulting nitrile, and replacement of the amino group with hydroxyl by the diazotization procedure; but in our hands the procedures specified by these workers gave very poor yields. By considerably modified procedures, however, it has been possible to obtain the desired acid satisfactorily from the same starting material by way of the same intermediates. The sodium salt of 4-naphthylamine-2-sulfonic acid (II) was obtained in good yield from the commercially available 4-naphthylamine-2,5-disulfonic acid (I) by reduction with zinc and sodium hydroxide according to a patent,[3] the yield being much better than that obtained by hydrolytic cleavage of the α-sulfonic acid group according to an earlier patent.[4] 4-Amino-2-naphthonitrile (III) was prepared by distillation of the sodium salt, II, with potassium cyanide. Potassium ferrocyanide, used by Butler and Royle,[2] gave consistently poor results (1–4% yield), and cuprous cyanide was useless on account of the uncontrollable frothing



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[1] Fieser and Cason, to be published.

[2] Butler and Royle, *J. Chem. Soc.*, 1649 (1923).

[3] Kalle and Co., German Patent 233,934 (1911).

[4] Kalle and Co., German Patent 64,979 (1892).