Presence of Hordenine in *Lophophora williamsii*

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RECENT STUDIES have shown that the peyote cactus, *Lophophora williamsii* (Lem.) Coulter, may contain several alkaloids which have not been reported previously (1–3). The alkaloids under current investigation are phenolic in nature and are of particular interest since it appears that both β-phenethylamine phenols and tetrahydroisoquinoline phenols occur simultaneously in the cactus, supporting previously described hypothetical biosynthetic relationships between these two types of alkaloids (4). Tetrazotized benzidine reagent (5) differentiates between *p*-hydroxyphenols, which react to give a yellow color, and those tetrahydroisoquinoline phenols known to be present in peyote, which react to give a red color.

Thin-layer chromatographic (TLC) analysis of peyote extracts indicated the presence of several compounds which react with tetrazotized benzidine reagent to give a yellow color. One compound consistently co-chromatographed in several TLC systems with hordenine (*N,N*-dimethyltyramine), an alkaloid which occurs in many species of *Gramineae* and in a few species of *Cactaceae*. Consequently, steps were taken to isolate and identify this alkaloid in peyote.

Dried peyote[1] was ground and defatted with petroleum ether in a Soxhlet extractor. The defatted drug was mixed with chloroform–methanol–ammonium hydroxide solution and subsequently extracted in a Soxhlet apparatus with chloroform. The chloroform was removed under reduced pressure, and the residue was extracted with ethanol. The ethanol solution was passed through a basic ion exchange column[2] and the column subsequently was rinsed with ethanol to remove nonacidic materials. The column was then eluted with 1 *N* hydrochloric acid, the eluant was adjusted to pH 8.0–8.5 with 7.5 *N* sodium hydroxide solution, and the solution freeze-dried. The residue was extracted with 10% ethanol in chloroform, and the extract was reduced to dryness.

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[1] Purchased from S. B. Penick and Co., New York, N. Y.

[2] Amberlite IRA-401, analytical reagent, Mallinckrodt Chemical Works, St. Louis, Mo.

The residue was applied to a column of activated silicic acid, the chromatogram was developed with 10% ethanol in chloroform, followed with 50% ethanol in chloroform. The eluant fractions were analyzed by TLC, and those fractions richest in hordenine were combined, concentrated to dryness, and the residue subjected to sublimation. The sublimate melted at 178–180°, showed no melting point depression when mixed with known hordenine HCl, and exhibited an infrared absorption spectrum identical to hordenine HCl. A solution of the salt was adjusted to pH 9.5, freeze-dried, and the residue subjected to sublimation. The sublimate melted at 118°, showed no melting point depression when mixed with known hordenine, and exhibited an infrared absorption spectrum identical to hordenine base. The free base of hordenine was converted to the methiodide, giving a melting point of 234–235°. It showed no melting point depression with known hordenine methiodide and exhibited an infrared absorption spectrum identical to known hordenine methiodide.

To ascertain that the hordenine isolated from commercially supplied peyote was not the result of contamination with one of the other hordenine-containing cacti, fresh plants of *L. williamsii*[3] were dried, ground, and extracted in an identical manner. The crude phenolic fraction was analyzed by TLC. A compound which co-chromatographed with hordenine was present, confirming the presence of hordenine in authentic plant material.

Details of the methods of isolation and identification of hordenine and of other unknown alkaloids of peyote will be published at a later date.

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[3] Identification confirmed by Dr. E. U. Clover, Botany Department, University of Michigan, Ann Arbor.