the alkaloids

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PREFACE

The editor, the publishers, and particularly the authors of previous volumes in this treatise are pleased with the reception accorded their efforts. Since there has been no abatement in the flood of publications dealing with alkaloids we have the temerity to add another review.

There are times when we would welcome more information than is accessible to us, so this is another invitation to authors to supply us with reprints.

R. H. F. MANSKE

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——CHAPTER 1——

STEROID ALKALOIDS: THE *VERATRUM* AND *BUXUS* GROUPS

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I. Introduction

Reviews of the chemistry of *Veratrum* alkaloids have been written by Kupchan and By (*1*) and of *Buxus* alkaloids by Černý and Šorm (*2*). In addition to the recently published results in the chemistry of plant steroids (*3*), steroidal and abnormal steroidal alkaloids have been reviewed by Sato and Brown (*4*). Goutarel (*5*) has summarized the latest advances among *Buxus* alkaloids. Some physicochemical and other data of *Veratrum* and *Buxus* alkaloids are given in the monograph by Raffauf (*6*). The progress in the *Veratrum* and *Buxus* alkaloids since the appearance of Volumes IX and X of this series is summarized in this chapter.

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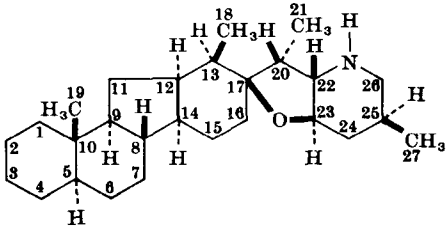
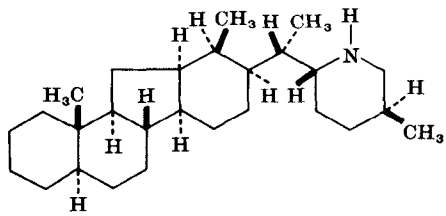
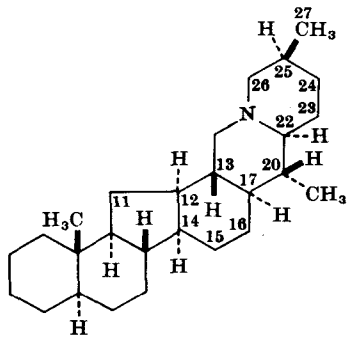
In agreement with the IUPAC Corrected Tentative Rules (*7*) for Steroid Nomenclature the *Veratrum* alkaloids are classified in the jervanine (**1**), veratranine (**2**), cevanine (**3**), and solanidanine (**4**) groups.



1 (22S,23R,25S)-5α-Jervanine



2 (22R,25S)-5α-Veratranine



3 (22S,25S)-5α-Cevanine

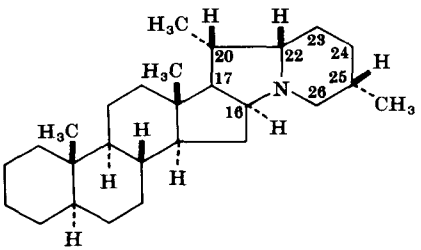
Veralkamine and veralinine are regarded as derivatives of the rearranged steroid hydrocarbon cholestane (**5**). However, there are also alkaloids possessing a normal cholestane skeleton (the 22,26-epiminocholestanes; *cf.* Vol. X, p. 60).

The alkaloid veramine could be considered a derivative of rearranged tomatanine (**6**) (*2*).*

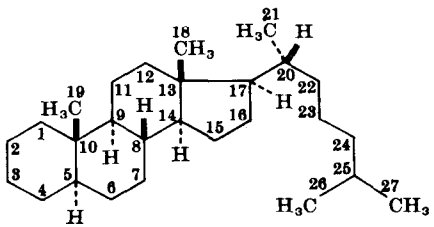
* Semisystematic names proposed by the IUPAC Committee for nomenclature could well be applied to *Veratrum* alkaloids with the exception of veramine. The C-16 hydrogen in veramine is β-oriented, whereas the side chain at C-17 is α-oriented; hence tomatanine, which has a C-16 α- and a C-17 α-hydrogen, could not be taken for the fundamental skeleton. Some other *Veratrum* alkaloids (*e.g.*, veralkamine, veralinine) having the C-17 side chain α-oriented are entered among the C-17 β-methyl-18-*nor*-epiminocholestanes.

To demonstrate the stereochemistry in the side chain we have applied the common graphic signs accepted in organic chemistry.

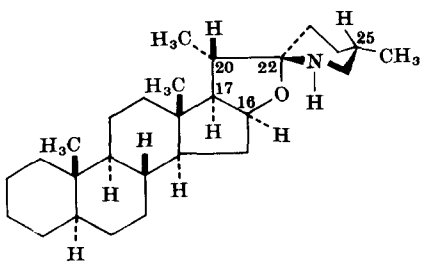
Attempts have been made to classify *Buxus* alkaloids according to various features. Thus cycloartenol (**7**) and cycloeucalenol (**8**) were proposed to be the fundamental skeletons characterizing two groups of *Buxus* alkaloids (*7a*). Another proposal was to divide *Buxus* alkaloids into cyclo-9β,19- (**9**) and 9(10 → 19)-*abeo*-pregnane (**10**) groups (*8*), or to classify them according to various substitution patterns (*9–11*). It seems, however, reasonable to distinguish *Buxus* alkaloids according to the number of nitrogen atoms incorporated. The letter suffixes A



4 (22S,25S)-5α-Solanidanine



5 5α-Cholestane

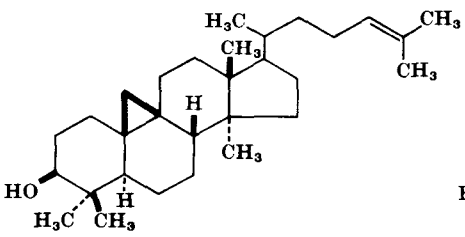


6 (22S,25S)-5α-Tomatanine

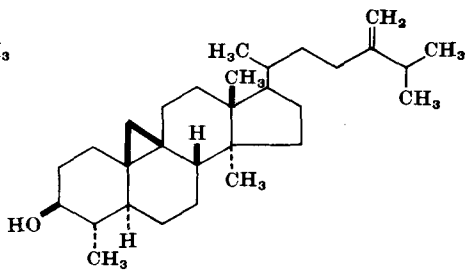
to P (Table I), indicating the number of methyl groups attached to nitrogen atom or atoms (*12*), offer a further subdivision of *Buxus* alkaloids. This classification has been used throughout this chapter.

The designation of *Buxus* alkaloids shown in Table I is, however, not based on general principles of organic chemical nomenclature; it is somewhat inconvenient to memorize; and it refers only to the methyl substitution on nitrogen. Nonetheless, the creation of new semisystematic names for all possible *Buxus* alkaloids would complicate still more the nomenclature hitherto used. Since *Buxus* alkaloids have the

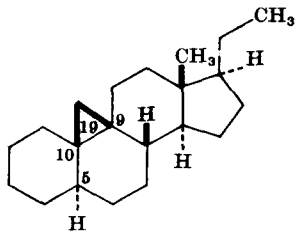
fundamental pregnane skeleton, it seems reasonable to designate them as derivatives thereof, applying the recommended IUPAC rules (*7*): for example, buxamine-A (**139**) = 3β,20α-bis(dimethylamino)-4,4,14α-trimethyl-9(10 → 19)-*abeo*-5α-pregna-9(11),10-diene; buxarine-F (**209**) = 16α-hydroxy-3β-benzamido-20α-dimethylamino-4,4,14α-trimethyl-9β,



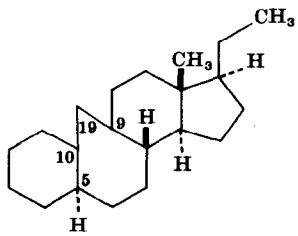
7 Cycloartenol



8 Cycloeucalenol



9 9β,19-Cyclo-5α-pregnane



10 9(10 → 19)-*abeo*-5α-Pregnane

19-cyclo-5α-pregnan-11-one; *trans*-cyclosuffrobuxinine-M (**262**) = *trans*-3β-methylamino-4-methylene-14α-methyl-9β,19-cyclo-5α-pregn-17-en-16-one; etc.