15.1 Introduction

Zhimu, Rhizoma Anemarrhenae, is the dry rootstock of *Anemarrhena asphodeloides* Bge. (Liliaceae) dug in spring and fall. It has been used for a long time in traditional Chinese medicine as an antipyretic, sedative, and diuretic agent.

15.2 Chemical Constituents

The main constituents of the rhizome of *A. asphodeloides* are saponins and sapogenins of steroid nature, especially sarsasapogenin and its glycosides. The sapogenins isolated and reported are sarsasapogenin (15-1) [1, 2], and markogenin (15-2) [3, 4]. They are derived from spirostane (15-3). Sarsasapogenin is the major sapogenin found in the rhizome.

The saponins isolated and reported are referred to as timosaponins, including timosaponin A-I, A-II, A-III, A-IV, B-I, and B-II [4, 5]. Timosaponin A-III (15-4) was obtained as a homogeneous substance and structurally determined [5]. Timosa-
ponin A-III, after completely hydrolysis with 2N HCl, yielded equimolar amounts of sarsasapogenin, D-glucose, and D-galactose. Partial hydrolysis yielded sarsasapogenin and a prosapogenin. The latter was identical with timosaponin A-I which on further hydrolysis gave sarsasapogenin and D-galactose. From the hydrolysate, O-β-D-glucopyranosyl-\((1\rightarrow2)\)-D-galactopyranose, timobiose, was isolated. Timosaponin A-I could be synthesized by reaction of sarsasapogenin with tetra-O-acetyl-β-D-galactopyranosyl bromide. Thus, the structure of timosaponin A-III was prove to be sarsasapogenin O-β-D-glucopyranosyl-(1→2)-β-D-galactopyranoside. Timosaponin B-I is a sarsasapogenin trihexoside containing one glucose more than timosaponin A-III.

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\text{Timosaponin A-III (15-4)}
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A. asphodeloides is representative of plants containing a high amount of sarsasapogenin for which it can be used as a source [6]. Saponins of A. asphodeloides are extracted by routine methods, hydrolyzed with HCl/EtOH, and the sapogenins then extracted with benzene. Sarsasapogenin can be purified by recrystallization from methanol.

Besides the saponins and sapogenins, some norlignans with inhibitory activity on cAMP phosphodiesterase, such as hinokiresinol (15-5) and oxy-hinokiresinol, were isolated from the rootstock of A. asphodeloides by extraction with chloroform and structurally identified on the basis of spectroscopic data [7]. 2,6,4′-Trihydroxy-4-methoxy-benzophenone and p-hydroxy-phenyl-crotonic acid have also been detected [7].

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\text{Hinokiresinol (15-5)}
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