Ginkgo biloba L. 73

73.1 Introduction

Baiguo, Semen Ginkgo, is the dry ripe seeds of *Ginkgo biloba* L. (Ginkgoaceae) collected in the fall when the seeds are ripe. This crude drug is officially listed in the Chinese Pharmacopoeia and used in traditional Chinese medicine as an antiasthmatic and against polyuria. The Chinese Pharmacopoeia also contains a note on the toxicity of the raw seeds.

Ginkgo biloba is the sole representative of its family and is not linked to any other living plant. The order Ginkgoales was once widely distributed throughout the world but in the past few million years all species except *G. biloba* have become extinct, the other species being found only as fossils, as that the ginkgo tree is called the "fossil tree." *G. biloba* was unknown outside the Orient before the eighteenth century but is now rather commonly distributed in Europe, America, and other continents.

73.2 Chemical Constituents

The purified lipid fraction, obtained from the nuts of *G. biloba* with a yield of 1.7% on a wet weight basis, is composed of ca. 90% neutral lipids, ca. 7% polar lipids [1], and ca. 3% glycolipids [2]. Main fatty acids in the triglyceride fraction are oleic and linoleic acid, and also palmitic acid in the phospholipid fraction. Enzymatic hydrolysis of the triglyceride and phosphatidylcholine fractions demonstrated relatively large amounts of unsaturated acids in the β-position. Analysis by gas chromatography-mass spectrometry of the steroid ester fraction indicated the presence of tetracosanoic, hexacosanoic, octacosanoic, and triacontanoic acids, of a lactone and of compounds suspected to be phenolic acids connected to long-chain diols [1]. The largest fraction of glycolipids was found to be digalactosyldiglyceride (64.1%), followed by monogalactosyldiglyceride (31.2%), and cerebroside (4.7%). The main component, amounting to 85% of total fatty acids, in the glycolipid fraction was α-hydroxypalmitic acid. The sugar component in the cerebroside was glucose [2].

In addition, a number of phenolic acids and phenols were isolated and identified as toxic principles of the raw fruit pulp of *G. biloba* [3, 4]. They are ginkgolic acid (*73-1*), hydroginkgolic acid (*73-2*), hydroginkgolinic acid (*73-3*), ginkgol (*73-4*), and bilobol (*73-5*) [5]. A further toxic principle from the seed of *G. biloba* was determined as 4-*O*-methylpyridoxine. It is proposed that this toxic principle causes food poisoning through not only antagonizing vitamin B_6 in the body, but also inhibiting the formation of 4-aminobutyric acid from glutamate in the brain [6].