1 Introduction

Swertia japonica Makino (Fig. 1) and S. pseudochinensis Hara (Fig. 2), biennial herbs of the family Gentianaceae, are found wild on sunny slopes of hills and mountains. S. japonica, 5–40 cm high, growing wild in Japan, Korea, and China, bears white five-petaled flowers with purple streaks in the autumn. S. pseudochinensis, growing wild in Japan, Korea, and the temperate regions of Southeast Asia, is much like S. japonica in external appearance, although it is a little larger and bears bright bluish purple flowers with purple streaks (Shibata 1944; Okuyama 1960; Namba 1980). All the parts of these herbs collected at flowering have been used as Japanese folk remedies as stomach bitters. S. japonica is especially important and officially listed in the Japanese pharmacopoeia, because it has the bitterest taste in the genus Swertia; it is now being tried as a hair tonic. On the other hand, S. pseudochinensis is inferior in the quality of its bitterness, which is explained by the chemical fact that this herb contains swertiamarin, which is less bitter than amarogentin and amaroswerin, which S. japonica contains, together with sweroside as major bitter constituents (Fig. 3) (Inouye and Nakamura 1971; Hayashi et al. 1976; Hayashi and Higashino 1976; Inouye et al. 1967; Sakamoto et al. 1983). Other species of this genus found wild in Japan are not used as medicinal plants. Chiretta, S. chirata Hamilton an annual herb of a height of about 1 m indigenous to mountainous districts of northern India, has been used as a tonic rather than a stomach bitter in India (Wallis 1960). The only countries which use the genus Swertia for medicinal purposes are Japan, China (Tibet), and India. Thus there are almost no Swertia species in use as bitters except S. japonica and S. pseudochinensis. In spite of the great demand for these herbs, their supplies still depend on wild sources which are becoming critical on account of the overharvesting of the plants and the progressive clearance of their habitats. It would therefore certainly be helpful to utilize in vitro culture techniques to ensure the supply of the crude drugs from these herbs and the production of secondary metabolites. Clonal propagation of plants for agricultural and horticultural uses has been carried out for a long time, and it is already being put to practical use in plants of various kinds; but also studied on the micropropagation of medicinal plants and the production of secondary metabolites are now increasing from year to year in spite of a belated start (see Bajaj et al. 1988).
Fig. 1. Two-year-old plant of *S. japonica* with flowers, growing wild in the field

Fig. 2. Two-year-old plant of *S. pseudo­chinensis* with flowers

Fig. 3. Major bitter glucosides in *S. japonica*