A New Tetragonal Sweetleaf Plant and Its Cutting Propagation©

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INTRODUCTION

Tetragonal sweetleaf (*Symplocos tetragona* Chen ex Y.F. Wu), a member of Symplocaceae, is a new woody ornamental evergreen plant. Since it was discovered in 1986 (Wu, 1986), this small evergreen tree attracted gardeners by its dense, glossy dark green foliage and round to pyramid habit. As a wonderful landscape tree, tetragonal sweetleaf is gaining popularity in urban landscapes and public areas and earning nicknames "forever green tree" (*Liuchunshu* in Chinese) and "fragrant mountain flower" (*Shanguihua* in Chinese). Tetragonal sweetleaf is native to China and mainly distributed in Hunan, Fujian, Zhejiang, and Jiangxi province (Qin and Li, 2007; Wu and Huang, 1987). To date, no record had been found for tetragonal sweetleaf in North America. This paper is to introduce this beautiful tree and share its cutting propagation method.

Morphology. *Symplocos tetragona* is a large shrub or small tree, which can reach 10 m tall (32 ft). Its yellowish-green, glabrous, and tetragonal young branches could be used to distinguish it from any other species (Fig. 1). Leathery and lustrous

Figure 1. Fruit branches and flowers.

glossy green leaves are simple, alternate, narrow-elliptic, and 12 to 14 cm long and 3 to 5 cm wide (5 in. × 1.5 in.). Leaf apex is acute, leaf base cuneate, and margin with coarse shallow serration. Petiole is about 1 cm long (1/3 in.). Flowers are in spikes or sometimes in panicles about 7 cm long (3 in.) and rachis covers with short-pubescence. Flower bracts are ovate, about 0.3 cm (0.12 in.). Each flower has five glabrous sepals, about 0.4 cm long (0.16 in.), slightly longer than or equal to the calyx tube; five white petals, about 0.6 cm long (0.24 in.) with very short corollar tube; 40–50 stamens; and one style, about 0.3 cm long (0.12 in.). The fragrant white flowers bloom for about 2 months, from January to February in the south, March to May in the center China. Drupe is oblong, about 1.5 cm long (0.6 in.), with persistent calyx (Fig. 1). Fruits are usually persistent from August to December (Deng et al., 2006b; Li and Tan, 2005; Wu and Huang, 1987; Xu et al., 2002).

Ornamental Features and Culture. *Symplocos tetragona* attracts many gardeners and landscapers due to its emerald green foliage and upright trunk forming a unique charming spherical or conical crown. Yellowish-green, tetragonal young branches always attract attention. The fragrant, white, and dense small flowers cover the whole canopy and make the plant an attractive flowering tree whether observed from a distance or close. These pleasant flowers usually last for 2 months. Mature drupes are blue-purple and add more ornamental interest (Li and Tan, 2005; Qin and Li, 2007).

As a great shade and landscape tree, tetragonal sweetleaf could be planted as a single specimen, in a row or random plantings, along roadsides, or as background plants for open areas. If planted against buildings this plant is better showcased. *Symplocos tetragona* grows well from full sun to partial shade and tolerates various soil types. No injury or damage had been observed at -12 °C (10 °F, U.S.D.A. Zone 8). Deng et al. (2007) indicated that this plant had the ability to absorb poisonous gases from the air, such as Cl_2, HF, and SO_2. It was particularly good for purifying sulfur pollutants and could absorb SO_2 at 11.98 $g \cdot kg^{-1}$ per year. Tetragonal sweetleaf forests can be used as a noise barrier (Qin and Li, 2007).

Propagation. Seed germination is the major propogation method. Seed has a thick seed coat, which is usually 90.2% of its total weight. The weight per 100 seeds is 14.33 grams (0.5 ounce, Xu et al., 2002). Deng et al. (2006b) sowed seeds on a prepared seed bed in the field in December and only 7.1% germination was obtained in next March and April. It is possible that the thick seed coat and possibly other dormancy factors contributed to the low germination rate. Xu et al. (2002) treated seeds with acid scarification, GA_3 soak, cold stratification, and combinations of these treatments. The highest germination rate, 44%, was recorded with the 500 $mg \cdot L^{-1}$ (ppm) GA_3 soak for 24 h. Obviously, further study should be conducted to address the low germination problem.

Cutting propagation is the most popular method to reproduce plants clonally (Dirr and Heuser, 1987). In China, a high percentage (97%) of rooted cuttings was reported under field conditions (Deng et al., 2006a). Cutting propagation with a peat moss and perlite medium under controlled conditions has been carried out and

Table1. Rooting hormones treatments for stem cuttings of *Symplocos tetragona*.

Treatment	Hormone (ppm)	Treatment	Hormone (ppm)
I	Control (CK)	II	Hormodin #1 (1000)
III	Hormodin #2 (3000)	IV	Hormodin #3 (8000)
V	K-IBA (1000)	VI	K-IBA (3000)
VII	K-IBA (8000)	VIII	K-NAA (1000)
IX	K-NAA (3000)	X	K-NAA (8000)
XI	K-IBA (5000) + Hormodin #2 (3000)		
XII	K-NAA (5000) + Hormodin #2 (3000)		

reported in this paper. Tissue culture of *S. tetragina* had been conducted without success (Deng et al., 2006a).

MATERIALS AND METHODS

Materials. Semi-hardwood terminal stem cuttings of *S. tetragona* were collected from 3- to 5-year-old plants at Hunan Botanical Garden in Changsha, China, in August 2008. The rooting hormones were the potassium salt of indole-3-butyric acid (K-IBA), potassium salt of naphthalene acetic acid (K-NAA), and powder formulations of indole-3-butyric acid (Hormodin #1, #2, and #3). The propagation medium was a mixture of perlite and peat moss (3 : 1, v/v).

Methods. The study was conducted from August to December 2008 in the propagation greenhouse at Central South University of Forestry and Technology in Changsha, China. Terminal stem cuttings were collected in the early morning on 7 Aug. Cuttings were placed into black plastic bags and immediately sprayed with water. In the greenhouse, each cutting was trimmed to approximately 10 cm (4 in. in length and stripped from the bottom to 3–4 top leaves. To reduce respiration and transpiration, two-thirds of each leaf on the cuttings was removed. The cuttings also received a slight wounding. A total of 11 hormone treatments and one control were tested (see Table 1). Cuttings were dipped into the liquid hormone solution for about 10 sec and followed by at least 15 min of air drying. For the Hormodin treatments, cuttings were dipped into tap water first and then dusted with the three Hormodin powders. Treated cuttings were inserted into $6 \times 6 \times 8$ cm^3 cells filled with the propagation medium in 32-cell flat trays. All cuttings were placed on mist benches covered with 80% shade cloth. The mist system was set for 20 sec every 10 min in the first 2 weeks, then 20 sec every 20 min thereafter during daylight hours.

A randomized complete block design was employed in this experiment. There were three replicates (benches) per treatment and five cuttings per replicate per treatment. Rooting percentage and root quality (root-ball volume) were collected after 18 weeks. All data were analyzed using Excel and SAS software. Mean separation was carried out using the least significant difference method with alpha at 0.05 level.

RESULTS AND DISCUSSION

The results indicated that tetragonal sweetleaf could be commercially propagated by semi-hardwood stem cuttings and the rooting hormones had significant effect on increasing the rooting percentage. The root quality (as indicated by root-ball volume) also had a similar trend as the rooting rate (Figs. 2–4).

Rooting hormones significantly increased rooting percentages from 40% (control) to100%. The highest rooting rate (100%) was obtained from cuttings treated with Hormodin #3. However, the root quality was only average level. Liquid hormones, K-IBA and K-NAA, also increased the rooting rates and quality, but not as well as the Hormodin treatments. It is possible that powder hormones might work better than liquid ones because they dissolved more slowly around the cuttings. Higher concentrations of K-IBA produced commercially acceptable rooting rates of 87% and 73%, but the low concentration produced a rooting rate of 40%. Potassium-NAA at 3,000 and 8,000 had a rooting percentage lower than that of K-IBA. Double dips with K-IBA + Hormodin #2 and K-NAA + Hormodin #2 did not produce any higher rooting percentage and better root quality than that of single dips (Figs. 2–4).

Hormodin rooting powder also greatly improved the root quality, which was indicated by the total root-ball volume. The highest root-ball volume, 315.1 cm^3, was obtained under the treatment of Hormodin #1. Cuttings treated with Hormodin #2 produced the second highest root-ball volume of 268.0 cm^3. Both cuttings treated with the lower K-IBA and K-NAA also showed a root system of 206.6 cm^3 or higher.

Stem cuttings of tetragonal sweetleaf could be produced commercially with 1,000 to 8,000 ppm Hormodin powders. To produce both high rooting rate and better root quality, Hormodin #1 (1000 ppm) should be applied. For liquid hormones, K-IBA at 3000 or 8000 ppm are also recommended.

Figure 2. Rooted cuttings (right) of *Symplocos tetragona.*

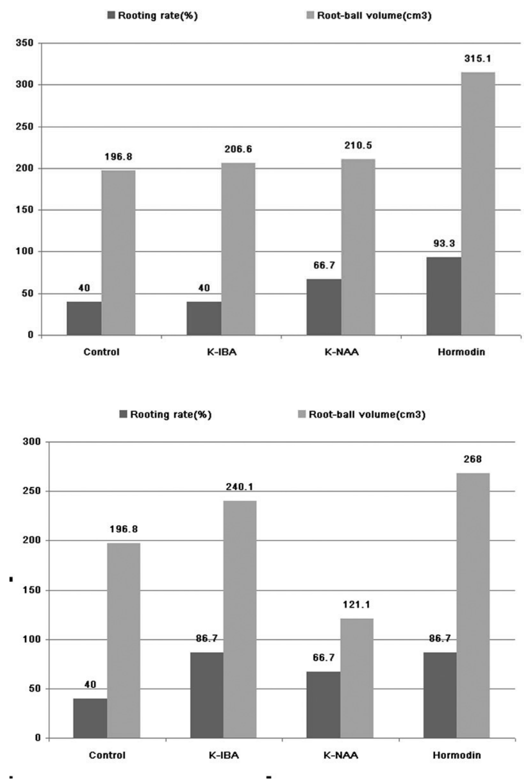

Figure 3A (top) and 3B (bottom). Rooting rate (%) and root-ball volume (cm^3) of *Symplocos tetragona* cuttings treated with rooting hormones at the concentration of 1000 ppm (top) and 3000 ppm (bottom), respectively.

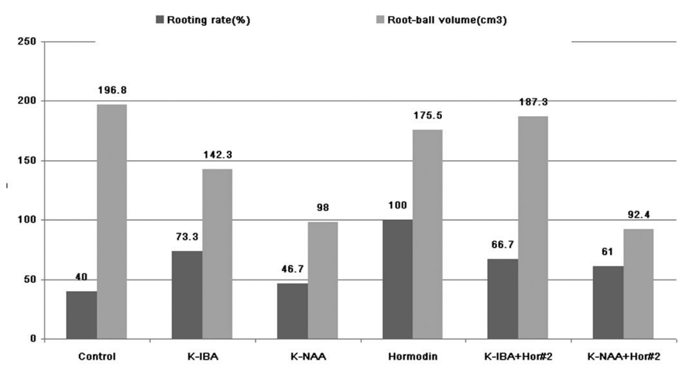

Figure 4. Rooting rate (%) and root-ball volume (cm^3) of *Symplocos tetragona* cuttings treated with rooting hormones at the concentration of 8000 ppm.

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