

SHORT COMMUNICATION

Description and Ecology of Indonesian Species *Tetrastigma glabratum* (Blume) Planch, a host of Rafflesiaceae

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Abstract

This article presents an overview of the current knowledge of *Tetrastigma glabratum* (Blume) Planch, a host of Rafflesiaceae, by providing information on botany and ecology of *T. glabratum*, and conservation status by propagating the plants vegetatively and monitoring its growth *in-situ* and *ex-situ*. The study was conducted in the protected rainforests at Mount Prau, Candiroto, North Kedu, Central Java between 2009-2014. Shoot growth and expansion in stem diameter were faster *in-situ* than *ex-situ* whereas the number of leaves was similar in both locations. *Ex-situ* conservation and cultivation is very important to protect these rare, unique, and endangered species from extinction.

Introduction

Tetrastigma Planch (Vitaceae) is the sole host species of the *Rafflesia* (Rafflesiaceae), a genus of parasitic plants that have the largest flower of all flowering plants, with *R. arnoldii* flowers reaching up to 150 cm in diameter (Nais 2001). *Rafflesia* plants live inside the roots and stems of *Tetrastigma* as the Rafflesiaceae entirely lack leaves, stems, roots and therefore are completely dependent on their host plants for nutrients and water. The centres of species diversity in *Rafflesia* are located in Borneo and Sumatra, also Malaysia, Thailand and the Philippines (Nais, 2001). Eight out of the 18 identified species were found in Borneo and Sumatra, two from Java, Indonesia. One species was reported from Thailand, three from the Peninsular Malaysia, and two from the Philippines.

Tetrastigma is a widespread genus of approximately 100 species occurring from Asia to Oceania (Ren & Wen, 2007). The name for the genus comes from the Greek words 'tetras' meaning four and 'stigma' which is the tip of the female pistil in a flower, in reference to the four-lobed stigma. The species are found in subtropical and tropical regions of Asia and Australia and suited to grow in hillsides and valleys of shady and moist primary rainforests. *T. glabratum*, also known and recorded as *Cissus glabrata*, is not recorded from Australia although

five other species have been identified in Queensland and New South Wales (north of Sydney) (Anonim 2013; 2014). Habitat loss has severely affected the distribution of the endemic and native plant species in the tropics. *Ex-situ* conservation and cultivation has become increasingly important to protect these rare, unique, and endangered species from extinction.

This article presents an overview of the current knowledge of *Tetrastigma glabratum* (Blume) Planch, a host of *Rafflesia* (Zuhud, 1998), by providing information on botany and ecology of *T. glabratum*, its traditional uses, and *in-situ* and *ex-situ* conservation status by propagating the plants vegetatively and report some observation on growth and development of *T. glabratum*.

The study was conducted in the protected rainforests at Mount Prau, Candiroto, North Kedu (7.3713900°S, 109.9866700° E) and at village Blumah, sub-district Plantungan located at the foot slopes of Mount Prau between 2009 to 2014. Blumah village is bound to the North by Tlogo Payung village; to the West by sub-district Bulang and Lampin River; to the East by village Kediten; and to the South by district Wonosobo (Anon 2009). The village is located about 95km north east of Semarang city, Central Java.

The location is classified as humid with relative humidity of 60-80%, soil pH of 6.9, slopes of up to 60°, temperatures of 20-25°C day and 16-20°C night (Lianah, 2013).

Botanical Description and Ecology

T. glabratum are climbing perennial vines with tendrils (Figure 1A) and the ability to grow to a height of up to 20 m, while their leaves consist of five leaflets, serrated and arranged palmately compound (Figure 1A). The stems are reddish (Figure 1A); their small flower clusters appear in the axils of the leaves, and are whitish in colour (Fig 1B).

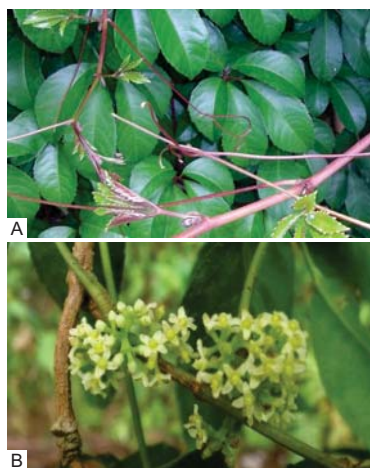


Figure 1. *T. glabratum* leaflets, stem and tendril (A), flower cluster (B).

The species appears to be endemic to the Mount Prau area as it has not been found in other areas (Lianah, 2013). It is growing in a mountainous area with an elevation >1300 m above sea level (Lianah, 2013). The local names of *T. glabratum* include walikadep (Lianah, 2013), gang putih, akar darik-darik, bantengan, oyod

epek and oyon waliran (Hyne, 1987). *T. glabratum* in Mount Prau were found climbing on meranak trees (*Castanopsis acuminatissima* (Bl.) A. DC. Meranak is the predominant tree growing at higher elevation on Mount Prau (Lianah, 2013). They are large trees of up to 40m height with a large canopy: the diameter of a mature tree can be more than 100cm.

Traditional Uses

The local people at Blumah Village have been using the liquid exudates from the stems of *T. glabratum* for generations. The exudate is believed to have a refreshing and stimulating effects, increase children's appetites and has been used as an important medicinal product in that area (personal communication: Supangat, 2011). The research in Indonesia on the medicinal properties of *T. glabratum* is still at the early stages. This is in contrast to another Tetrastigma species, *T. hemsleyanum*, a Chinese endemic species (Ren and Wen, 2007) that has been studied for many years in China and has been demonstrated to be effective against inflammatory disorders, as an analgesic and antipyretic (Liu et al., 2002).

Table 1. *In-situ* and *ex-situ* vegetative growth of *T. glabratum* from May to October 2010.

Vegetative Growth	<i>In-situ</i> ¹⁾	<i>Ex-situ</i> ²⁾
Survival (%)	100	75
Leaf number	20-31	20-31
Increase in shoot growth (mm)	23-28	13-29
Increase in stem diameter (mm)	3.7-8.9	1-3
Biomass (g)	2500	800

¹⁾ Protection forests at Mount Prau, Candirotto, North Kedu.

²⁾ Blumah Village, Candirotto, North Kedu.

Observation on *T. Glabratum* Growth and Development

This description is based on our research and observations of this plant between June – October 2010 (five months) as the plant grew in its natural habitat at Mount Prau and at Blumah village greenhouse.

Our research demonstrated that this species is hard-to-root (Lianah, 2013). Propagation from stem cuttings resulted in only seven percent of the planted cuttings rooted and survived (Lianah, 2013) despite optimizing the vegetative propagation environment for hard-to-root species. The majority of the stem cuttings experienced browning and finally died. Preliminary examination at the Biology laboratory at The University of Gadjah Mada, Indonesia, indicated that the leaves and stem of *T. glabratum* contains high concentration of phenols and flavonoids (Lianah, 2013). A number of naturally occurring compounds and enzymes, including phenols,

have been reported to affect rooting (Krisantini, 2005).

Plant growth *in-situ* at the protected rainforests at Mount Prau and *ex-situ* at Blumah village is described in Table 1. Plant growth was measured every month for five months. Generally shoot growth and expansion in stem diameter were faster *in-situ* than *ex-situ* (Table 1). The number of leaves was similar in both locations as the plants in the greenhouse at Blumah village received plenty of sunlight as opposed to the shaded environment *in-situ*.

Tetrastigma glabratum is a slow-growing plant, and it needs about five years' growth from cuttings until the diameter of the plant stem reaches 2-3 cm and can be harvested (Lianah, 2013). Therefore, this plant is increasingly rare because people take those five-year-old plants, and they are not available to reproduce.

Further study is currently under way to optimise the propagation of this hard-to-root species and to measure

propose to educate the community to preserve this endangered species.

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