

XANTHOSTEMON CHRYSANTHUS (F. MUELL.) BENTH.: A NEW FLOWERING TREE FOR URBAN LANDSCAPES

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ABSTRACT

Xanthostemon chrysanthus (F. Muell.) Benth. or golden penda is an exotic flowering tree introduced into Malaysian landscape. Golden penda is one of the various species planted in urban areas for beautification purposes. It has showy yellow inflorescence which attracts nectar-feeding birds and insects. Under local climate conditions, this species flowers throughout the year, however, there is no distinctive flowering season. It is considered as a hardy species because it's able to adapt to planting site with low soil moisture content, nutrients deficiency, and high soil penetration resistance. This paper concluded with the recommendation that *X. chrysanthus* can be a good candidate for urban landscapes as it can tolerate the harsh environment while enhancing the aesthetic value and biodiversity of the urban areas.

Keywords: Golden penda, flowering tree, horticulture, ornamental, urban forestry

Introduction

Urban trees provide valuable ecological, social and economic benefits to urban residents (Dwyer *et al.*, 1992; Nowak & Crane, 2002; Nowak *et al.*, 2006). Earlier studies have shown that one of the functions of trees is to increase the aesthetic of urban environment (Schroeder & Cannon, 1987; Dwyer *et al.*, 1992). In landscaping, tree appearance is very important to enhance the value and quality of a space. Texture, form, size and colour are the physical qualities of plants that offer attention, variety, and aesthetic appeal to the surrounding areas (Hansen and Alvarez, 2010). The ornamental factor of a tree includes flower presence and appearance, foliage colour and texture, bark characteristics and attractive crown shape (Kuhns and Rupp, 2000). Among these characteristics, colour usually attracts most attention. Some trees produce colours through its young leaves, fruits, trunks and barks, while others have distinctive unique flowers. Therefore, proper tree selection should be taken into consideration in creating desired effects of a landscape. In addition, the trees should be managed systematically to ensure that they are functioning and contributing to users' satisfaction.

Flowering trees are widely planted to beautify parks, road sides, open spaces and residential areas. A survey conducted by Sreetheran *et al.* (2011) on five major roads in Kuala Lumpur found flowering trees such as *Pterocarpus indicus* (angsana) and *Peltophorum pterocarpum* (jemerlang) were widely planted. In other city, Kuching, Sarawak, Siti Rubiah (2008) reported that a species with fragrant floral, *Michellia* sp. (cempaka) dominated the road sides. In Malaysia, *P. indicus* was the earliest tree planted in urbanized areas. This species was planted in Malacca in 1778 (Koenig, 1894) and 1802 in Penang (Burkill, 1966). It became a popular urban tree due to its attractive crown shape, beautiful yellow flower and easy to propagate (Wong, 1982; Sanderson *et al.*, 1997; Philip, 1999). However, severe attacked by unknown disease was reported in 1935 which affected the trees (Furtado, 1935). Later, in 1985, a similar symptom known as wilt disease was also diagnosed in Singapore and on the East Coast of Peninsular Malaysia in 1992 (Sanderson *et al.*, 1997; Philip, 1999). It was determined that a fungus, *Fusarium oxysporum* was the causal agent of the wilt disease. Extensive planting of this species in the urban areas throughout the country probably aided the rapid spread of the disease (Philip, 1999). As a consequence, *P. indicus* is progressively being replaced by various indigenous and exotic flowering trees as listed in Table 1.

Planting of various tree species will not only increase the aesthetic values of the urban areas but it's also offer ecological services such as climate amelioration, giving shade, and providing habitat for urban wildlife. Species richness and density are associated with the quality of the urban areas. For instance, many studies showed that birds as a biological indicator of the urban biodiversity. Most of the studies reflected that urban center have lower species richness of birds and this increases from suburban areas to agricultural, rural and natural land (Savard *et al.*, 2000; Chace & Walsh, 2006). Hence, it is essential to grow suitable plant species that offers different types of food sources for the inheritance of the urban wildlife.

Table 1: Common flowering tree planted in the local urban areas (Source: Adnan, 2003)

Botanical name	Common/local name	Family	Flower colour
<i>Bauhinia blakeana</i>	Butterfly tree/tapak kuda	Leguminosaceae	Red
<i>Cananga odorata</i>	Ylang-ylang/kenanga	Annonaceae	Yellow
<i>Cassia fistula</i>	Indian laburnam	Leguminosaceae	Yellow
<i>Delonix regia</i>	Flame of the forest/semarak api	Leguminosaceae	Red
<i>Erythrina glauca</i>	Coral tree/dedap hijau	Leguminosaceae	Red
<i>Hibiscus tiliaceus</i>	Sea hibiscus/bebaru	Malvaceae	Yellow
<i>Jacaranda filicifolia</i>	Guarani/jambul merak	Bignoniaceae	Purple
<i>Lagerstroemia speciosa</i>	Rose of India/bungor	Lythraceae	Pink
<i>Mesua ferrea</i>	Iron wood/penaga lilin	Guttiferae	White
<i>Michellia champaca</i>	Yellow champaca/cempaka kuning	Magnoliaceae	Yellow
<i>Mimusop elengi</i>	Spanish cherry/tanjung	Sapotaceae	White
<i>Peltophorum pterocarpum</i>	Yellow flame/jemerlang	Leguminosaceae	Yellow
<i>Plumeria</i> spp.	Frangipani/kemboja	Apocynaceae	Red/white/yellow
<i>Tabebuia pallida</i>	Tecoma/tabebuia	Bignoniaceae	White
<i>Tabebuia pentaphylla</i>	Tecoma/tabebuia	Bignoniaceae	Pink/white

This paper describes the special characteristics of *X. chrysanthus* which made the species one of the preferred candidates for urban beautification and conservation purposes. The landscape uses of the species are also elaborated.

Xanthostemon chrysanthus

Recently, an exotic ornamental species, *X. chrysanthus* (F. Muell.) Benth. is widely grown due to its morphologically unique yellow florals. *Xanthostemon chrysanthus* (golden penda) belongs to the family of Myrtaceae. It is locally known as jambu kuning. In Greek, *xanthos* means yellow and *stemon* is stamen, while *chrysos* is gold and *anthos* is flower (Elliot, 2010). It is indigenous to tropical northern Australia, New Caledonia, New Guinea, Indonesia and the Philippines (Sosef *et al.*, 1998). The genus of *Xanthostemon* has about 45 species and *X. chrysanthus* is among the 13 species found in its origin, Australia (Wilson, 1990).

Special characteristics of *X. chrysanthus*

Xanthostemon chrysanthus is a shrub to medium-sized tree. It grows up to 10-15 m in height in its natural habitat (Anonymous, 2006), but usually smaller in cultivation. It has glossy elliptic leaves that arranged in whorls along the stem and measured approximately 15 cm in length and 5 cm in width (Figure 1a). The new foliage is initially red or light green and turns into dark green when mature. The yellow inflorescence (8-12 cm diameter) blooms at the ends of the branches (Figure 1b). Each inflorescence is made up of numerous small individual golden flowers sized 1-2 cm diameter. The numerous stamens are the primary characteristic of the flower (Figure 1c). The flower blooms for a period of 40 days starting from inflorescence bud swelling until flower senescence, offering its unique landscape feature (Ahmad Nazarudin, 2015). In addition, it attracts nectar-feeding birds and insects which also an added values in the landscape. Sadasivam (2014) concluded that urban wildlife in Kuala Lumpur is rapidly declining and that there is a greater need to promote programs and activities to preserve and enhance the urban wildlife. Hence, introducing new tree species such as *X. chrysanthus* might be helpful in increasing the biodiversity of the urban areas.

This species can be propagated through seeds and stem cuttings. In sub-tropical and tropical regions, *X. chrysanthus* planted from seed flowers within 2-3 years (Anonymous, 2006). In its origin Australia, flowers appear at any time of year (Elliot *et al.*, 2010). Recent study under local climate conditions also found that this species flowered throughout the year without distinctive flowering season (Ahmad Nazarudin *et al.*, 2014). However, the abundance of flowers was fluctuated between months depending on the occurrence of drought period and precipitation (Ahmad Nazarudin, 2015). Previous research revealed that the major environmental factors which control the flowering transition were photoperiod, temperature and water availability (Bernier *et al.*, 1993; Wilkie *et al.*, 2008).

A single fruit of *X. chrysanthus* is about 10-12 mm in diameter, rounded in shape and woody (Figure 1d). The inedible fruits are green at young stage and turn into dark brown when mature. It required two to three months to reach fruit maturity stage (Ahmad Nazarudin, 2015). Fully ripened fruits will split open to disperse their tiny seeds (Figure 1e). It was estimated that 1 kg of *X. chrysanthus* seeds is equivalent to 960,000 dry seeds (Sosef *et al.*, 1998).

Figure 1: Growth stages of *X. chrysanthus*

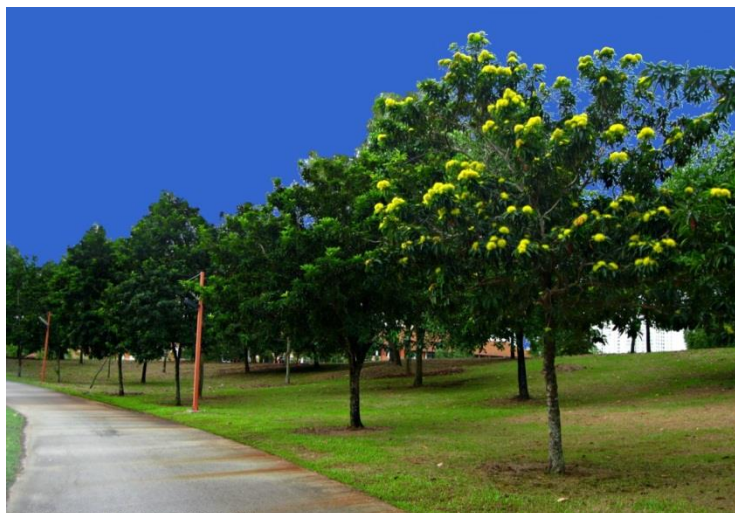


Landscape uses of *X. chrysanthus*

Xanthostemon chrysanthus grows in open forest or rainforest, often along the banks or creeks and rivers (Hyland *et al.*, 2010). In landscaping, this species can be used for screening plant, windbreaker, specimen plant, or for beautification of road sides, parks, pocket spaces around buildings, golf courses and house lawns (Figure 2). *Xanthostemon chrysanthus* is a hardy species as it grows well in full sun, tolerates acidic soil and resists pollution and tropical heat (Anonymous, 2010). It grows well in subtropical gardens with fair drainage and sunny aspect (Elliot *et al.*, 2010).

This species is capable of tolerating low soil moisture content, low soil fertility and site with relatively high soil penetration resistance (Ahmad Nazarudin *et al.*, 2014). Earlier study by Sinnott *et al.* (2008) indicated that tree root expansion was considerably impeded at penetration resistance values between 2 and 3 MPa. Other works from agricultural crop root development found that root growth of *Pinus radiate* seedlings was greatly impeded at penetration resistance values more than 1.3 MPa (Zou *et al.*, 2001) and 1.5 MPa (Boone and Veen, 1994). The root of *Gossypium* sp., *Pisum* sp. and *Arachis* sp. ceased when the penetration resistance reached 2 MPa (Taylor and Ratcliff, 1969) or 3 MPa (Greacen and Sands, 1990; Boone and Veen, 1994). *Xanthostemon chrysanthus* was found able to withstand with soil penetration resistance of more than 2.9 Mpa (Ahmad Nazarudin *et al.*, 2014). For these reasons, *X. chrysanthus* become a prime candidate for urban planting.

Figure 2: Road sides planting of *X. chrysanthus*



Conclusion and recommendations

Xanthostemon chrysanthus can be considered as a good candidate for urban planting as it flowers throughout the year and also able to tolerate the harsh urban environment. Introducing of *X. chrysanthus* in urban areas is an option to enhance the aesthetic and biodiversity of flora and fauna. Further investigation on the growth performance of this species in different urban sites throughout Malaysia is suggested. Site availability, reliable weather logger as well as funding are among the limitations that need to be highlighted in future research on flowering of tropical urban trees.

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