

UNIVERSITI TEKNOLOGI MARA

**GROWTH, PHYSIOLOGICAL AND
FLOWERING RESPONSES OF
Xanthostemon chrysanthus (F. Muell.) Benth.
TO PACLOBUTRAZOL AND
POTASSIUM NITRATE**

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulation for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Xanthostemon chrysanthus (F. Muell.) Benth. or golden penda (locally known as jambu kuning) is gaining its popularity in Malaysian landscape. However, under local climatic condition, the flowering of *X. chrysanthus* is very erratic and inconsistent. An investigation on the growth, physiology, flowering and identification of a suitable practice to induce flowering of this species was carried out. Based on the Biologische Bundesanstalt, Bundessortenamt and Chemical Industry scale, nine principal growth stages, i.e. bud development (stage 0), leaf development on tree branches (stage 1), formation of side shoots (stage 2), shoot elongation (stage 3), inflorescence emergence (stage 5), flowering (stage 6), fruit development (stage 7), maturity or ripening of fruit and seed (stage 8) and fruit senescence (stage 9) were determined in *X. chrysanthus*. Vegetative and reproductive stages of this species were completed within 198 and 176 days, respectively. *Xanthostemon chrysanthus* planted in loamy sandy soil at two selected urban sites in Kuala Lumpur, i.e. Metropolitan Batu Park (MBP) and Pusat Bandar Manjalara (PBM) showed that trees at MBP, which is a recreation park with bigger planting area, had better growth performance than those trees at road median at PBM. Significant higher coarse sand content in soil of PBM influenced the water holding capacity, causing significantly lower growth responses, especially the relative growth rate of canopy diameter and leaf area index. Physiologically, higher photosynthetic rate, transpiration rate and stomatal conductance were recorded during rainy season with vegetative branches as compared to reproductive branches. Profuse flowering was observed with some trees at MBP in certain times while none of the trees flowered at some other times. On the other hand, moderate flowering was observed with all under study trees at road median at PBM at all time. A suitable approach to induce flowering was identified using a synthetic plant growth regulator (paclobutrazol, PBZ) combined with potassium nitrate (KNO_3). Nine treatments with nine replicates, of different concentrations of PBZ and KNO_3 , were assigned in a completely randomized design. PBZ lengthened the flowering period to up to 73 days as compared to only 40 days for the control tree. However, smaller flower and lower flower abundance were observed with PBZ treatment. Concurrent vegetative growth inhibition included reduced tree height, diameter at breast height, canopy diameter and leaf area, while leaf area index and relative chlorophyll content increased with PBZ alone or with combined treatment of PBZ and KNO_3 . Palisade parenchyma thickness in the leaf was drastically increased, while xylem thickness in the stem reduced with PBZ existence. Similarly, photosynthetic rate, transpiration rate and stomatal conductance were reduced with PBZ. Total phenolic content was found increased, while total non-structural carbohydrate was reduced with the existence of PBZ. However, lower dosage of 0.125 mg l^{-1} PBZ combined with 100 g KNO_3 per tree produced highest number of flowers per inflorescence and increased the inflorescence size. In addition, photosystem efficiency measurement showed that the trees were well adapted with the treatments. The practice of using PBZ and KNO_3 has the potential as a tool to improve the aesthetic value of this species. It can be considered as a good candidate for the urban landscape. Besides being able to be induced to flower better, it also tolerates the harsh urban environments that are highly exposed to various biotic and abiotic stresses.

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