

## Watering and nitrogen and potassium fertilization: The significance of abiotic control on *Gynura procumbens* (Lour.) Merr herbs in Malaysia for better growth and secondary metabolite enrichment

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**Abstract.** Environmental changes have led to cellular adjustment and adaptation in plant growth. External factors have, for example, influenced the growth pattern of *Gynura procumbens* plants and led to production of specific secondary metabolite internally for the purpose of differentiation and conditional interaction. These developmental patterns and production of metabolites are expressional characteristics of the plant, and so growers can have only a restricted range of movement or limited control over their reaction to environmental changes compared to their reaction to human or animal interactions. Even though metabolite production is pervasive among the plants, the need to explore abiotic control strategies for regulating the patterns of growth of *Gynura procumbens* as well as their accumulation of metabolites has been shown to be significant in recent studies of plant-abiotic interactions.

**Keywords:** Abiotic, growth, *Gynura procumbens*, herbs, metabolite

### INTRODUCTION

#### **Conventional value of *Gynura procumbens*.**

Traditionally, Malaysia has had an extensive array of herbal medicinal plant species and traditional medical systems. More than 2,000 medicinal plant species have been recorded locally with herbal products forming the most important components (Samah *et al.*, 2010; Sekar *et al.*, 2014). A review of ethno medical information related to medicinal plants in Malaysia produced a list of most important herbal medicinal plants used for various illnesses, including *Gynura procumbens* (*G. procumbens*), *Eurycoma longifolia*, *Labisia pumila*, *Ficus deltoidea* and *Zingiber officinale* Roscoe. The treatments included aphrodisiac, anti-diabetic, anti-microbial, anti-pyretic, anti-oxidant, anti-inflammatory, anti-cancer and anti-diuretic ingredients (Arifullah *et al.*, 2014; Keng *et al.*, 2009; Sekar *et al.*, 2014).

**Modern value of *Gynura procumbens*.** *G. procumbens* was listed as a high-value herbal plant under the Agricultural National Key Economic Area (NKEA) Initiative for Herbal Subsector in 2010 (MOA, 2015).

Later, the Global Information Hub on Integrated Medicine, Malaysia (Globinmed) was also set up in line with the significantly increased role of traditional and

complementary medicine production called for by the Malaysian government. The Globinmed has promoted the importance of medicinal plants by compiling the Malaysian Herbal Monograph (MHM) database in order for the interested parties to have a point of reference. The corporation also extended the initiative up to the South East Asean (ASEAN) region by establishing the ASEAN Task Force on Traditional Medicine (ATFTM). This step was positive since the interest in using and producing products based on herbs, especially *G. procumbens*, was shared by the ASEAN community in Thailand, Philippines, Indonesia and Malaysia (Globinmed, 2015).

All this while, the plant was planted and consumed domestically as a folk medicine because of their medicinal properties, including reported anti-diabetes, anti-hypertension and anti-cancer effects (Adnan and Othman, 2012; Rahman and Al Asad, 2013). Recently, the Economic Transformation Programme (ETP)

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