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Effect of NPK and silicon fertilizer on growth, flowering, and nectar of *Turnera ulmifolia* L.

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Effect of NPK and silicon fertilizer on growth, flowering, and nectar of *Turnera ulmifolia* L.

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Abstract. *Turnera ulmifolia* L. is a beneficial plant mostly planted in the oil palm plantation as it is easily adapting to a variety of environmental conditions, mainly to conserve beneficial insects. Nevertheless, the planted plants were left without proper maintenance and less study was conducted on biological control agent conservation. Thus, this study aimed to examine the effect of NPK, silicon fertilizer and their combination on the growth and development of *T. ulmifolia*. Treatments including T0 Control (No fertilization application), T1 (0.2 g NPK), T2 (0.2 g NPK+3.9 g silicon), T3 (0.2 g NPK+4.9 g silicon), T4 (3.9 g silicon) and T5 (4.9 g silicon) were applied 20 days after transplanting at monthly interval for three months. Results revealed the greatest height and number of branches were observed in T1. Overall, the chlorophyll content ranged between 27.92 to 31.18 SPAD values. All treatments gave the same effect on morphometric measurements on the first 30 days of observation. After 60 days, the greatest value for broad tube width and length was observed in T4 which differs significantly from other treatments. The application of fertilizer in T1, T2 and T3 showed 10-20% promotive effects over the control in the amount of nectar produced per flower. For all three observation periods, a similar trend was recorded for the total sugar concentration in flowers, where the mean total sugar content was between 1.37 and 1.61 mg per flower.

Keywords: Oil palm plantation; biological control; beneficial insects; chlorophyll content; morphometric measurements.

1. Introduction

The use of indigenous natural enemies of pests in conjunction with strategic cultivation techniques such as planting flowering plants that attract beneficial insects and applying organic fertilizer is becoming increasingly important. In oil palm plantation, *Turnera ulmifolia* L. was identified as a suitable species for enhancing the natural enemies of bagworm as it is favoured by predators and parasitoids. *Turnera ulmifolia* L., a member of the Turneraceae family [1] is native to Mexico and the West Indies and is commonly known as "Bunga Pukul Lapan". It is a beneficial plant that is easily adapted to a wide variety of soil and environmental conditions which makes it easier to colonize new habitats [2].

Turnera ulmifolia L. contains nectaries and have a high content of volatile compounds that are attractive to the natural enemies of the targeted crop [3]. Natural enemies such as parasitoids are dependent on a sufficient supply of pollen and nectar as essential dietary requirements. The quantity and quality of nectar and the number of flowers are critical for increasing parasitoid populations, and for the conservation of natural enemy populations. The sugar and amino acid composition of nectar and pollen, which varies greatly between plant species [4], is primarily responsible for floral resource food quality.

In most cases, *T. ulmifolia* were planted in oil palm plantations that were not maintained and not fertilized properly. Considering the benefits of fertilization that might alter the nectar composition of *T.*