

**UNIVERSITI TEKNOLOGI MARA**

**STUDY OF BAGWORMS (*Metisa  
plana* AND *Pteroma pendula*)  
INFESTATION IN RELATION TO  
MULTI-TROPHIC SYSTEM ON OIL  
PALM PLANTATION**

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**PhD**


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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 results 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.

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## ABSTRACT

The bagworm (Lepidoptera: Psychidae) is one of the plant leaf-eating insect pest causing outbreak in oil palm plantations in Malaysia especially in Perak. In fact, a severe infestation by bagworm cause yield losses of more than 50% over few years. The study aimed to determine the population dynamic of bagworms, natural enemies and competitor insects in assessing the effect from plant traits, climatic factors, and plant response in order to develop control strategies based on influence of multi-trophic system. All related sampling was properly collected in both immature and mature oil palm. Leaves sampling also be done in field and leave analysis in laboratory over a sampling period. Furthermore, analysis between trophic level was conducted to evaluate the direct impact between bagworms population and its variables. As result, the study had confirmed that the natural enemies played a key role in suppressing the bagworm population. *Goryphus bunoh* is one of the parasitoid species detected that highly influence on the population number of bagworms where statistically shows that there was significant correlation between *Goryphus bunoh* and bagworm, especially in mature oil palm area. Thus, effect on C:N ratio also contributing as significant relationship (N=240, P<0.05, r=-0.203) towards population of bagworms in mature oil palm area. However, contradict result was observed in immature oil palm area compared to mature oil palm area (N=240, P>0.05, r=0.069). The climatic factors particularly temperature, and rainfall was negatively affected while positive result was affected on relative humidity. towards the population of bagworms. Meanwhile, the induction of TPC and TFC activities was detectable and appeared differently upon both mature and immature oil palm area. The findings showed that negative correlation between both TPC and TFC against population of *M. plana* and *P. pendula* in mature oil palm. Therefore, analysis of multi-trophic level based on the RDA models shows that bagworm (*M. plana* and *P. pendula*) was highly correlated with number of parasitoids in both mature and immature oil palm areas. Thus, the TFC and relative humidity were also more influence on the population of bagworms. Based on this information, the trend of biotic and abiotic factors was able to predict precisely by this multi-trophic system model. Hence, this would be formulated the strategies based on the trend of major controlling variable that influenced and affect the population number of bagworms. In order to regulate the high population of bagworm, it is suggested that natural enemies and plant traits component (C:N ratio, TPC and TFC) to be enhanced further. The plant traits component can be enhanced by practising efficient nutrient management and natural enemies can be enhanced via planting beneficial plant in the oil palm plantation. Enhancement of natural enemies would be better option due to environment and health awareness.

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