Megaselia scalaris AS FEED OF DOMESTICATED *Aerodramus fuciphagus* SWIFTLET

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ABSTRACT

As modern poultry production system evolved, their efficiency has improved tremendously. Similar phenomena may happen to swiftlet production, but it will require bold approaches and innovations. In the last few decades, we saw swiftlet population is also undergoing initial evolution process-moving out of caves. Cave is swiftlet's natural habitat and living place. However, currently houses are built by farmers with micro-environment similar to cave situation. Together with the advancement in audio system, ample of condusive artificial swiftlets living places were offered where swiftlets can stay, build nest and multiply. At the same time, physical translocation whereby the swiftlet chicks are removed from cave, hand raised and released back to natural habitat and some returned to houses is also taking place (1). Both efforts should increase swiftlet population. Unfortunately, the rate of expansion of the "man made caves" is observed to be faster than swiftlet population increment. As the result, some of the houses that are less conducive are facing a challenging task to attract swiftlet to stay in and start producing edible bird nest (EBN). Since the industry is newly develop in Malaysia, controlling new houses establishment is not the answer considering the enviable and lucrative expected return on investment. Thus, additional effort to increase swiftlet population through captive breeding or domestication is a moving forward strategy that requires serious consideration.

Swiftlets are insectivorous. They eat insects while flying over various tree canopies which termed as foraging. Foraging areas are areas where swiftlets are hunting for insects which include forest, plantations (oil palm, rubber and paddy), and fruit orchards. Areas in the town and city where their houses are located are considered

as socializing areas where swiftlets met before they call off the day and enter their respective house.

Type or orders of insects may vary slightly from one canopy to another. Recent study by Kamarudin and Anum (2) over palm oil plantation in Johor where colonies of swiftlets were also observed foraged, indicated that majority of insects found were from order of Diptera (55.7%) and Hymenoptera (19.9%). Although the study suggested that the two insects order might be the main diet of swiftlets, this suggestion was not substantiated with actual insects found in gastro-intestinal tract of the swiftlet. However, study by Lourie and Tompkins (3) on feed boluses of the white nest swiftlet *A. fuciphagus* showed main insects found were order of Diptera (39.2%) and Hymenoptera (38.6%). Swiftlets sampled in Lourie and Tompkins study were from Gomantong Cave in Sabah. Foraging areas of swiftlets in Gomantong are both forest and palm oil canopies. Based on these two studies, it can be concluded that most insects available over foraging canopies in Malaysia are order of Diptera and Hymenoptera and both insects are the main component of swiftlets diet.

In order to domesticate the swiftlet, their feed requirement must be addressed. Insect order of Diptera is potentially be the best candidate to be cultured as swiftlet feed. In addition to natural component of swiftlet diet, other criteria for choosing types of insects are important to be considered as well. Such criteria are: i) size of insect - should be between 2-5 mm, larger insects are difficult to be swallowed, while smaller insects difficult to be cultured in enclosed house, ii) texture of insect – hard bodied insect such as order of Coleoptera (beetle) may be less suitable as it is difficult to be digested, iii) versatility - insect that easily bred and multiplied in various feeds and perform well at wide range of micro-environment, iv) short life cycle – ability to complete a full cycle of less than normal 3 weeks is added advantage for quick and mass production, v) high feed conversion - the highest insect yield over feed utilized economically is the better choice, and vi) high nutritional value - since swiftlets are producing protein rich saliva, insects for their diet must also contains high protein.

As one of our research milestone (4), we had successfully mass produced insect order of Diptera (5). The insect is *Megaselia scalaris* (Fig. 1). This insect is easy to culture in the laboratory (6) and has attempted by researchers in other countries including Indonesia. The life-cycle of *M. scalaris* was observed to be completed within

11.5-16.5 days. Durations for each step of the cycle are as the following: Egging (12 hrs), egg-larvae (1-2 days), larvae-pupae (3-5 days), pupae-adult fly (7-9 days).

Fig. 1: Adult *M. scalaris* is yellow-brown in colour, while the larvae are white and appear transparent, pupae on the other hand is also yellow-brown in color. A complete cycle of the insect is between 11.5 – 16.5 days.

To further optimize the insect production, effect of feed moisture content on pupae production, weight and adult emergence were studied (7). It was found that moisture content of insect feed at 50-80% was the best for *M. scalaris* cultivation. Watery feed with water content of more than 80% resulted in high mortality of larvae and subsequently reduced pupae emergence. In addition, effect of temperature on the development of various stages of *M. scalaris* was also examined (8). It was found that culturing temperature of 27^{o}C was the most suitable temperature that gave high larvae survival rate and shortest development time from larvae to pupae stage. Thus, wet feed with moisture content of 50-80% and room temperature of 27^{o}C are the best micro-environment for culturing *M. scalaris*.

The nutritional standard for swiftlet has not been established. This mean feed requirement for swiftlet is still based on estimation. Analysis on EBN showed it contained very high crude protein at 62% (9). Obviously in order to produce such high protein saliva, swiftlet shall be offered considerable protein rich insects. Our study indicated that *M. scalaris* that we cultured is having crude protein of 58%. Hence, the total protein requirement might be sufficient; however certain essential amino acids such as lysine and methionine need to be supplemented. In actual situation, we soaked the insects in the amino acid solution before given to the swiftlet to ensure that the essential amino acids are not deficient.

In conclusion, we observe that the swiftlet industry is undergoing evolution, from cave to house, and towards fully in-captivity. Various aspects and challenges are needed to be addressed and overcame in order to expedite the process. One of the most

important aspects is the swiftlet feeding. Since swiftlet is insectivore, insects must be cultured and may form one of the important swiftlet diets. *M. scalaris* used in the study is successfully cultured and will be candidate for the main feed component of the domesticated swiftlets.

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