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ENVIRONMENTAL PARAMETERS IN SUCCESSFUL EDIBLE BIRD NEST SWIFTLET HOUSES IN TERENGGANU

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Abstract: Most edible bird nest (EBN) swiftlet farming industry enterpreneurs suffered losses due to lack of knowledge in providing the right environmental parameter factors in their EBN swiftlet houses as EBN production is influenced by various environmental parameter factors such as air temperature, surface temperature, relative humidity, light intensity, internal and external sound levels in swiftlet houses. This study compared environmental parameter factors in coastal, rural and urban areas in Terengganu to investigate environmental parameter factors that play a critical role in determining the success of a swiftlet ranching venture. Air and surface temperature, relative humidity, light intensity, and sound level were recorded in 30 EBN swiftlet houses in three different area; 10 in coastal, rural and urban area in Terengganu respectively. Mean EBN and individual swiftlet population were 81 nests, 210 individuals in rural; 53 nests, 137 individuals in coastal and 23 nests, 59 individuals in urban area. Rural area houses had most suitable range for swiftlet adaptation. EBN production was significantly higher in swiftlet houses with suitable environmental factors such as air and surface temperature were 30.1°C, relative humidity 83.7%, light intensity 0.16 lux, with sound 47dB (internal) and 68dB (external). As such, rural areas will be most productive to build EBN swiftlet house.

Keywords: Air and surface temperature, sound level, swiftlet ranching, sustainable management

Introduction

Swiftlets are from the family Apodidae and Apodidae refers to a mixed group of small sized swifts (Lim & Cranbrook, 2002). Currently there are 24 species of swiftlets recorded in the world (Ibrahim *et al.,* 2009). The five most common species of swiftlets found in Malaysia and Borneo Island are *Hydrochus gigas, Collocalia esculent* (White Belly Swifts), *Cypsiurus balasiensis* (Asian Palm Swift), *Aerodramus maximus* and *Aerodramus fuciphagus* (Ibrahim *et al.,* 2009). However, only Edible Bird Nest (EBN) swiftlets from *Aerodramus fuciphagus* are commercially farmed.

The nest of *Aerodramus fuciphagus* are harvested for human benefits. Swiftlets use a glutinous secretion which is nest cement to bind together materials for nest building (Lim & Cranbrook, 2002). Swiftlet ranching posses the potential to grow into a multi-million ringgit industry due to its relatively profitable risk return profile as well as a continuosly growing demand for Edible Bird Nest (Merican, 2007). EBN are very important in Chinese cuisine and medication. They can be considered as exotic food that can also be used as materials for physical strength enhancing medication (Retno & Soedarmanto, 2005).

In Java, people have been successfully ranching EBN swiftlets in man-made houses which closely resemble their natural cave habitat for more than a hundred years (Mardiastuti & Soehartono, 1996). People have built structures to create a cave-like atmosphere, condusive for the birds to built EBN away from caves (Mardiastuti & Soehartono, 1996). The EBN swiftlet houses, as they are often referred to, were first set up close to the coast. However, as the bird population grows, they can now be found far inland (Lim & Cranbrook, 2002).

Several factors must be closely controlled and monitored in order to create suitable environmental conditions to attract EBN swiftlets to come in and build their nests. Air and surface temperature, relative humidity, light intensity and sound level are the most important factors in EBN swiftlet houses (Ibrahim *et al.,* 2009).

Light must be very low inside the structure to provide an environment that is very similar to that usually found in dark caves (Nasir, 2009). An environment that is very high in humidity can cause fungus build-up and prevent EBN swiftlets from building their nests. On the other hand, low humidity will cause nests not to adhere to the nesting plank (Nasir, 2009).

Objective

To compare environmental parameter factors in coastal, rural and urban areas in Terengganu.

Hypothesis

H1 = Suitable environmental factors in swiftlet house will have a positive effect on the production and quality of the EBN produced.

H0 = Unsuitable environmental factors in swiftlet house will have a negative effect on the production and quality of the EBN produced.

Method

This research was conducted in Terengganu, Malaysia, in the districts of Kuala Terengganu, Marang, Setiu, Besut, Dungun, Kemaman and Kuala Berang, as these areas have the highest number of swiftlet houses (Figure 1). Sampling was conducted from September 2016 until Mac 2017, in 30 swiftlet houses from three different areas in Terengganu, with 10 in coastal, 10 in rural and 10 in urban areas (Table 1).

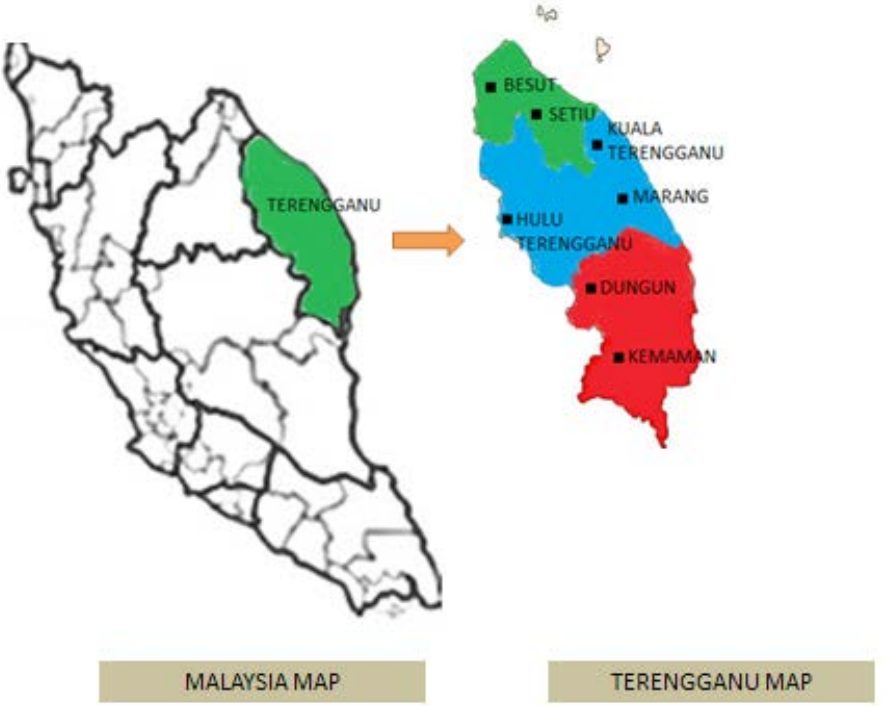

Figure 1: EBN swiftlet sampling sites

Table 1: Location and number of swiftlet houses

Location	Number of swiftlet house
Coastal	10
Rural	10
Urban	10

Equipments used were the Data Logger Thermometer (TES1315), for measuring air and surface temperature; Thermal hygrometer (ATM, HT-92130), to measure relative humidity, Light meter (TES 1336A), to measure light intensity and Sound level meter (TES 1351B), for measuring sound level in swiftlet houses.

The equipments were placed in three different locations in each swiftlet house for data collection as recommended by Ibrahim *et al.* (2009). For identifying the environmental factors that affect environmental factors in swiftlet houses, several different monitoring configuration were undertaken. Data on the swiftlet houses that are related with environmental factors will be collected.

The suitable time to record the data on air and surface temperature, relative humidity, air velocity and light intensity was between 10.30 a.m. to 3.30 p.m. as the swiftlet house is vacant due to the swiftlets out searching food and will come back around 3.30 p.m. (Retno & Soedarmanto, 2005). Swiftlets will be scared away if the inside of the houses are frequently disturbed and visited (Lim, 2006). Therefore, the best time should be chosen to refrain from entering the swiftlet houses unnecessarily.

According to Mardiastuti and Soehartono (1996), the numbers of swiftlets in the house could be calculated by estimation of the harvest from one breeding season. One nest contains two individual swiftlets. This estimate is for breeding pairs or individuals only. For the number of the non-breeding individuals (juveniles, nestling, fledglings), it is estimated to be 30% of the population. The total population of swiftlets is the sum of breeding pairs and the number of non-breeding individuals, as the formula below.

Total Numbers = Breeding individuals + Non-breeding individuals
Breeding individuals : 1 nest represent 2 individuals
Non-breeding individuals : 30% from breeding individuals

For example, 65 nests were collected in a swiftlet house from one breeding season. To get total numbers:
Total Numbers = Breeding individuals + Non-breeding individuals
Breeding individuals : 1 nest represent 2 individuals
65 nest = 130 individuals

Non-breeding individuals : 30% from 130 individuals = 39 individuals
Total Numbers : 130 individuals + 39 individuals = 169 individuals

Results and Discussion

Temperature and Relative Humidity

EBN swiftlet houses in the rural area recorded the highest mean air and surface temperature with 30.1°C. This was followed by EBN swiftlet houses in the urban area with 28.8°C. Houses in the coastal area recorded the lowest mean air and surface temperature of 28.7°C.

The highest mean relative humidity was recorded in EBN swiftlet houses in the urban area with a value of 92.8%. This was much higher than the values recorded in EBN swiftlet houses in the rural and coastal areas with 83.7% and 81% respectively. According to Ibrahim *et al* (2009), the suitable relative humidity in swiftlet houses is 80-90% (Table 2).

Environmental Factors	Rural Area (Mean)	Coastal Area (Mean)	Urban Area (Mean)
Air temperature	30.1°C	28.7°C	28.8°C
Surface temperature	30.1°C	28.7°C	28.8°C
Relative humidity	83.7%	80.7%	92.8%
Darkness	0.16 lux	0.18 lux	1.43 lux
Sound level	47 dB	64 dB	83.7 dB
	68 dB	70 dB	77 dB
	(External)	(External)	(External)
Number of nests	81	51±3.27	23
Swiftlet population	210 individuals	133 individuals	59 individuals

Temperature is a very important factor that should be considered in swiftlet houses (Nasir, 2009). The temperature in swiftlet house should be similar with temperature in the swiftlets' natural habitat, which is in limestone caves (Nasir, 2009). According to Ibrahim *et al* (2009), suitable temperature for swiftlet house is 26 to 35°C.

Temperature and relative humidity in swiftlet house play an important role in production of swiftlet nest. Temperature and relative humidity is very important for easier swiftlet nesting, to ensure that swiftlet nest do not crack on their nesting planks, a high hatchery rate of swiftlet eggs and high quality of swiftlet nest (Hendri, 2007).

Naturally, swiftlets will first observe the swiftlet house design as they enter. If the temperature and relative humidity in swiftlet house are suitable for them, they will nest on the nesting plank. Sometimes, swiftlets will move from one nesting plank to another until they find their suitable nesting plank (Hendri, 2007). If temperature and relative humidity are not suitable for them, they will move to another swiftlet house. Production in swiftlet house that does not have suitable temperature and relative humidity will be slower compared to a swiftlet house that have the suitable temperature and relative humidity (Hendri, 2007).

Lighting in EBN Swiftlet Houses

The mean light intensity values recorded in EBN swiftlet houses in rural, coastal and urban areas were 0.16 lux, 0.18 lux and 1.43 lux respectively. According to Ibrahim *et al.,* (2009), the suitable light intensity in swiftlet house is less than 1 lux (Table 2).

Factors that influence lighting in swiftlet house are the size of entrance hole, colour of wall and floor, and height of space that light can enter (Hendri, 2007). Decreasing the size of entrance hole will decrease the light entering in the swiftlet house while decreasing the width and height for the area that light can enter will increase lighting in the swiftlet house (Hendri, 2007).

Sound System in EBN Swiftlet House

Based on the data recorded, all swiftlet houses except in the urban area had a mean external sound level that was louder than that of the internal. The houses in the urban areas recorded the loudest mean external sound level with the value of 77.0 dB, closely followed by coastal area with 70.0 dB and rural area of 68.0 dB.

The highest internal mean sound level was recorded in swiftlet houses in the urban area with the value of 83.7 dB. This was followed by coastal and rural areas with 64.0 dB and 47.0 dB respectively. However, the suitable sound level in swiftlet house is only around 40 dB and 60-80 dB for external sound (Ibrahim *et al.,* 2009). (Table 2).

EBN swiftlets are very responsive towards sounds that are similar with their voice (Nasir, 2009). When swiftlets fly, they will find sounds that are similar with their voice (Nasir, 2009). Majority of EBN producers will use swiftlet sound from cassette or compact disk (CD) to attract swiftlets to enter their swiftlet house as

swiftlet ranching will have high potential of success when using swiftlet sound (Nasir, 2009).

Edible Bird Nest Swiftlet Population

The swiftlet houses in the rural area attracted the highest population of EBN swiftlets with 210 individuals. The second highest population was the swiftlet houses in the coastal area with 137 individuals and the swiftlet houses with the least population was those of the urban area with only 59 individuals (Table 2).

The swiftlet house in the rural area produce highest population of EBN swiftlet because, in that area, the environmental factors such as air and surface temperature, relative humidity, light intensity and sound level are in suitable ranges. Swiftlets will adapt to swiftlet house that possess environmental factors similar with their natural habitat which is in limestone caves.

The swiftlet house in urban area produce lowest production of EBN as the relative the relative humidity and sound level is high as compared to the recommended range.

Data Analysis

Based on the t-Test statistical analysis, results showed that there were significance differences in production of nest from swiftlet house with suitable environmental factors and those without (t value 9.0016, P = 0.0004).

Environmental factors are very important factors that require serious consideration before constructing swiftlet house (Nasir, 2009). This is because swiftlets will only adapt in the swiftlet houses that possess environmental conditions similar with their natural habitat. As such, production of EBN in swiftlet house that possess suitable environmental factors is high as compared with those without.

Conclusion

To be productive and profitable entrepreneurs in EBN swiftlet farming, it is suggested to ensure and control environmental factors with these ranges: temperature 30.1°C, relative humidity 83.7%, light intensity 0.16 lux, sound level (internal) 47 dB and (external) 68 dB.

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