NUTRITIONAL COMPOSITION OF SWIFTLETS FAECES FOR FUTURE USAGE

AZIZON A.[1], ALI S.[2], WAN ZAHARI M.[2] AND MOHD. BOHARI J.[3]

1 Regional Veterinary Laboratory, Kota Bharu Kubang Kerian, 16150 Kota Bharu, Kelantan,

2 Faculty of Veterinary Medicine, Universiti Malaysia Kelantan, Locked Bag 36, Pengkalan Chepa, 16100 Kota Bharu, Kelantan, Malaysia

3 Veterinary Research Institute, 59, Jalan Sultan Azlan Shah, 31400 Ipoh, Perak,

* Corresponding Author: azizon@dvs.gov.my

ABSTRACT. A total of 104 samples of Swiftlet faeces were collected from various districts in Kelantan (n:55) and Terengganu (n:49). The samples were analysed for dry matter (DM), crude protein (CP), ether extract (EE), Ash, Calcium (Ca) and Phosphorus (P). The overall mean concentrations of organic matter (OM), CP, Ash, Ca and P from those samples were 72.25 %, 68.23 %, 8.84%, 1.01% and 1.19% respectively while the mean nitrate (NO_3) content was estimated 48.33%. There were no significant differences ($P<0.05$) between districts in the OM, Ca and P content. However, significant differences ($P<0.05$) were observed in the CP, NO_3 and ash content between districts. The potential of swiftlet faeces as the source of superior quality fertilizer and other usage are highlighted.

Keywords: swiftlets, faeces, nutritional composition

INTRODUCTION

Lately, swiftlet ranches industry has been observed to grow at the fast rate in Malaysia. The main reason is attributed to the emphasis given by the Ministry of Agriculture and Agro-based Industries, specifically as one of the income generators. Among others, the indicators are significant increases in the development of both new swiftlet houses and the conversion of existing shop houses to swiftlet houses. Currently, the rearing activities are even extended to the residential and urban areas, which in many cases aggravate environmental and socio – economic problems. It is evident that edible-birdnest (EBN) is the ultimate product of the venture with enormous monetary return. Quality of EBN is of concern to many swiftlet operators as it greatly determines the price and its trade barrier (Andy Rahmat Hidayat, 2011 and Kamarudin, 2012).

One of the by-products from swiftlet industry which needs to be efficiently exploited is the faecal wastes. The contribution of its faecal wastes cannot be underestimated as it has potential to be utilized for many purposes. This trial was carried out to look into these issues.

METHODOLOGY

A total of 104 faecal samples were collected from various swiftlet houses in Kelantan (n=55, from 8 districts) and Terengganu (n=49, from 2 districts). Sampling distribution from each district per state is shown in Table 1. Difference from the State of Kelantan, swiftlet ventures in Terengganu are not widespread throughout the state, but rather centralized in two main districts only (i.e. Kuala Terengganu and Marang), with the number of samples 29 and 20 respectively. All samples were analysed for dry matter (DM), crude protein (CP), ether extract (EE), Ash, calcium (Ca) and phosphorus (P). Method of analysis is as described (AOAC, 1997). On the other hand, organic matter (OM) was calculated based on [DM – ash] while nitrate (NO_3) was estimated by [CP/6.25] X 4.427.

All results were statistically analysed by SPSS (Version 16) and analysis of variance (ANOVA) was conducted to find differences between means.

Table 1. Number of Samples Collected Per District in Kelantan and Terengganu

State	District	No.
Kelantan (55)	Kota Bharu	14
	Pasir Puteh	5
	Jeli	3
	Machang	6
	Tumpat	8
	Bachok	8
	Pasir Mas	4
	Kuala Krai	7
Terengganu (49)	Kuala Terengganu	29
	Marang	20
Total		**104**

Table 2. Mean Composition of Selected Nutrients in the Faecal Samples of Swiflets Collected From Kelantan and Terengganu (n: 104)

Nutrients	Mean	SD	Minimum	Maximum
DM	81.1	9.94	44.49	96.35
OM	72.25	11.66	26.65	87.63
CP	68.2	21.58	18.31	121.21
EE	0.998	0.578	0.02	3.04
Ash	8.84	4.76	0.78	33.36
Ca	1.007	1.00	0.1	5.35
P	1.186	0.432	0.03	2.33
NO_3	48.33	15.29	12.97	85.86
CP : OM	0.953	0.299	0.23	2.19
Ca : P	1.34	2.64	0.01	18.78
P : Ca	4.04	10.07	0.05	76.0

Table 3. Mean concentration of nutrients in faecal swiftlet between district in Kelantan and Terengganu

District/ Nutri-ents	Kota Bharu	Pasir Puteh	Jeli	Mach-ang	Tumpat	Bachok	Pasir Mas	Kuala Krai	Kuala Tereng-ganu	Marang	Overall mean
DM	84.34	76.84	67.9	87.74	82.8	79.17	83.53	85.87	80.38	78.77	81.08
OM	73.97	67.9	54.61	75.21	75.2	66.62	75.56	78.73	73.15	70.72	72.25
CP	80.48	69.47	49.25	48.68	65.54	60.16	59.87	71.82	76.31	61.05	68.23
EE	1.05	1.48	0.58	0.92	0.93	0.8	0.78	2.03	1.01	0.69	0.99
Ash	10.37	8.94	13.29	12.53	7.61	12.55	7.97	7.14	7.23	8.05	8.84
Ca	1.09	0.71	1.09	1.64	0.88	1.68	0.86	1.06	0.59	1.22	1.01
P	1.39	1.4	0.81	1.26	1.38	1.08	1.23	1.16	1.08	1.13	1.19
NO_3	57.01	49.21	34.89	34.48	46.42	42.61	42.41	50.87	54.05	43.25	48.33
CP : OM	1.12	1.02	0.85	0.65	0.87	1	0.81	0.92	1.04	0.86	0.95
Ca : P	0.98	0.53	1.47	1.29	0.83	2.01	0.7	0.92	0.71	2.9	1.34
P : Ca	4.41	2.46	1.56	1.5	10.4	1.33	1.89	1.85	6.14	2.01	4.04

Table 4. Chemical composition of organic fertilizer based on livestock waste

Source	N	P	K	Ca	Mg	Mn	Fe	Cu	Zn	B	C/N
Cattle	2.22	0.82	0.76	1.90	0.54	414	3754	27.2	105	33	13.3
Sheep	2.27	0.64	5.37	1.28	0.98	416	3953	26.2	200	38	15.6
Chicken	3.05	2.60	2.21	8.51	0.80	389	2381	39.6	214	30	8.4

Source: Mohd Najib (Personal Communication)

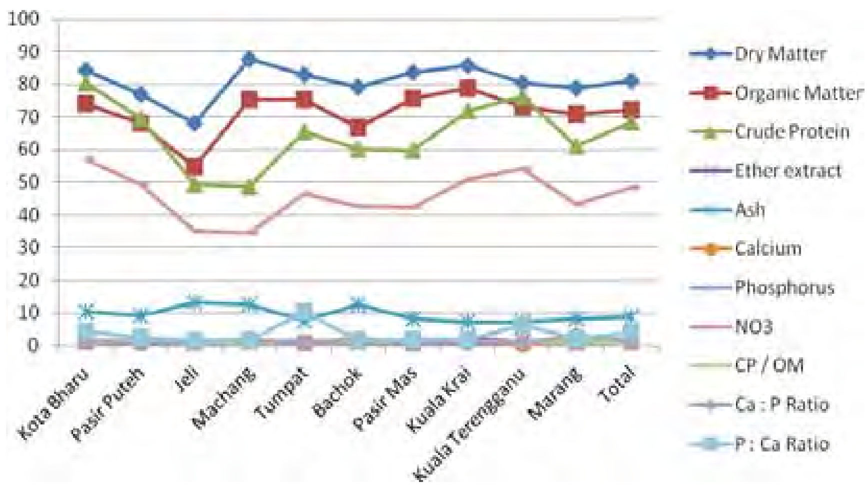

Figure 1. Distribution of nutrients in faecal swiftlet between district in Kelantan and Terengganu

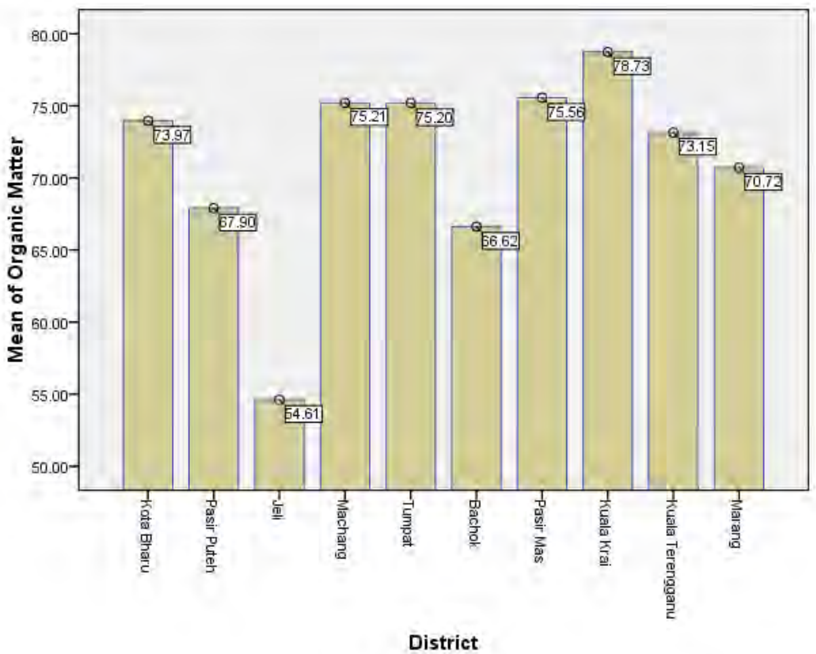

Figure 2. Mean Organic Matter Content in Faecal Samples between Districts

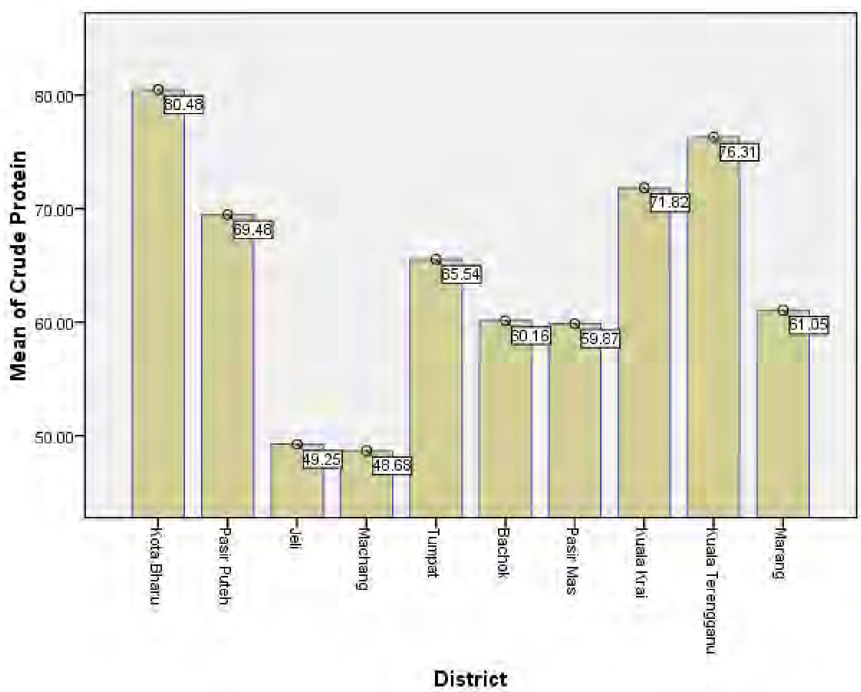

Figure 3. Mean Crude Protein Content in Faecal Samples between Districts

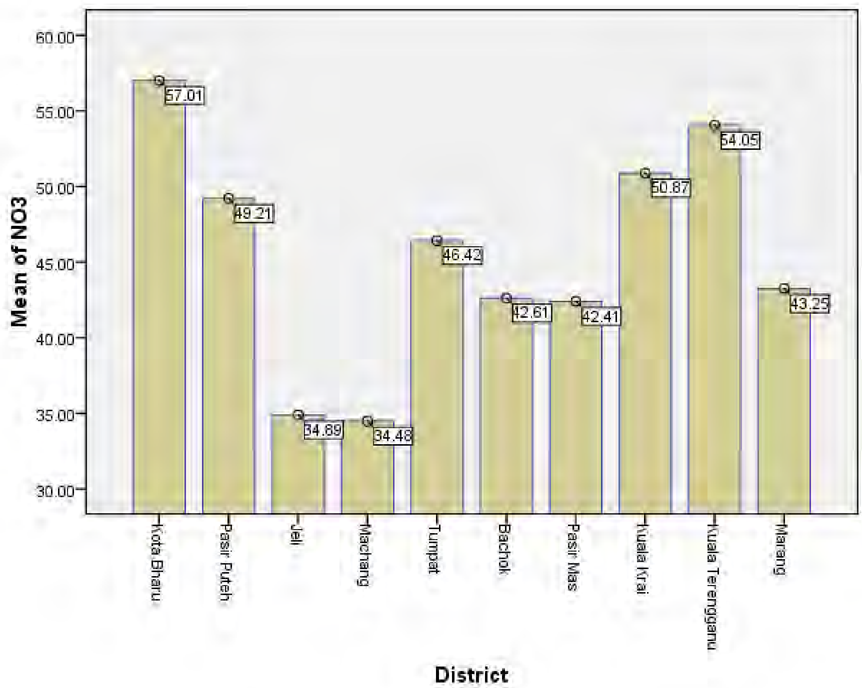

Figure 4. Mean Nitrate (NO_3) Content in Faecal Samples between Districts

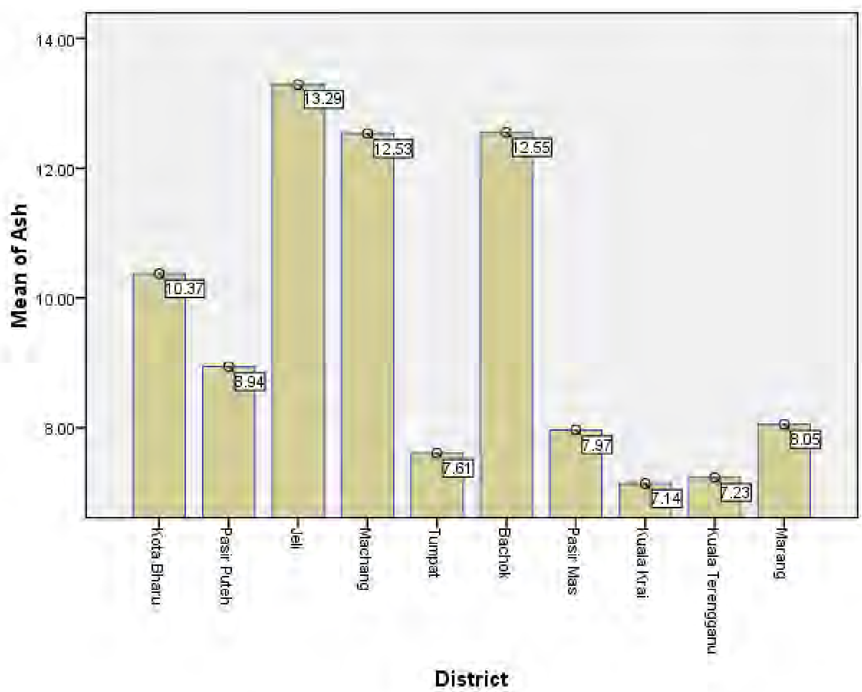

Figure 5. Mean Ash Content in Faecal Samples between Districts

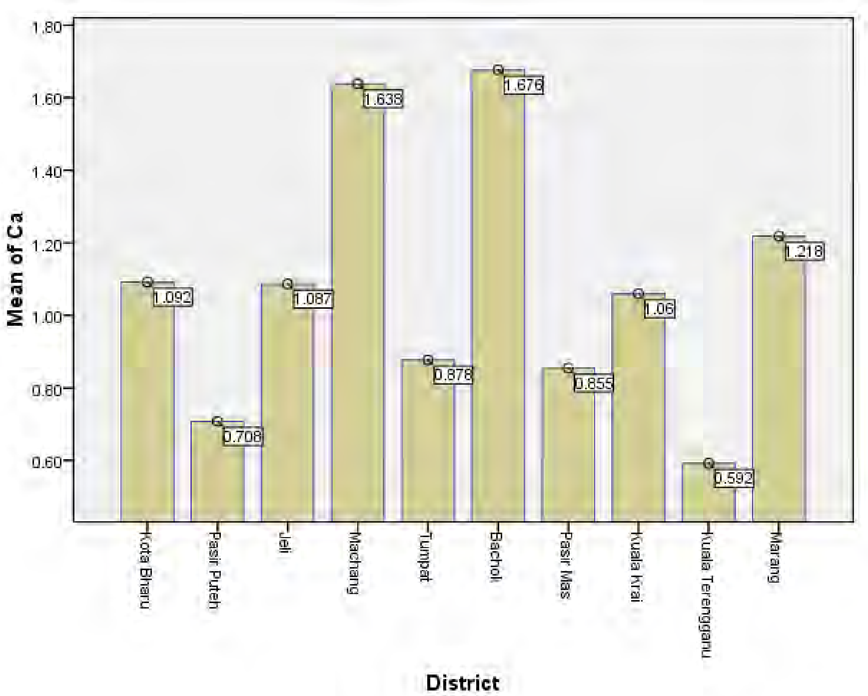

Figure 6. Mean Ca Content in Faecal Samples between Districts

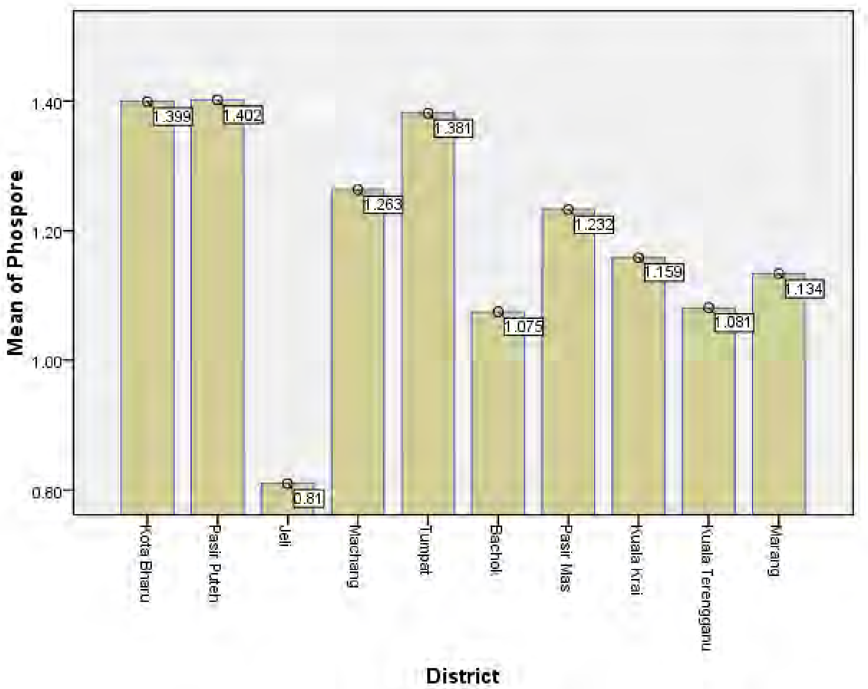

Figure 7:. Mean P Content in Faecal Samples between Districts

RESULTS

The overall mean and the ranges of DM, OM, CP, EE, Ash, Ca, P, NO_3, Ca:P and P:Ca ratio in the faecal samples of swiftlets irrespective of the districts is shown in Table 2. Mean and detail distribution of the nutrient concentrations in each district is shown in Table 3 and Figure 1.

DISCUSSION

The mean concentration of DM of the faecal samples regardless of the location of the bird houses of the two States is 81% with the range of 44.49 – 96.35%. The highest and lowest DM content were recorded from Machang and Jeli with the respective mean values of 87.74% and 67.9% (Table 3). There were no significant differences between districts in the DM content but lower concentrations were observed in Bachok and Pasir Puteh, Kelantan. Significant variations in DM content between faecal samples are understandable as samples were not collected at the same time, coupled with differences in the age of bird houses. Longer established bird houses usually accumulated more faecal matter and over time of storage, will result in higher dry matter content owing to increased moisture and vapour loss. However, it is not clear whether this phenomenon is the casual factor in the case of Bachok and Pasir Puteh samples as similar trend was not observed in faecal organic matter (Figure 2). Highest OM concentration was obtained in samples from Kuala Krai (mean 78.73%) while the lowest was from Jeli district (54.61%).

Significant differences were observed in the faecal CP concentrations between districts with samples from Kota Bharu showing the highest (80.48%) and Machang the lowest (48.68%) (Figure 3). Similar trends were also observed in the estimated concentrations of NO_3 with the mean values of 57.0% and 34.48% for faecal samples in Kota Bharu and Machang respectively (Figure 4). The ratios of CP:OM in the two districts were 1.11:1 and 0.6:1 respectively as compared to 0.95:1 for the overall mean of all of the districts studied.

There were significant differences between districts in the faecal concentrations of ash and EE. Mean ash content was highest in faecal sample from Jeli (13.29%). while those from Kuala Krai the lowest (7.14%) (Figure 5). Interestingly, the reverse was observed in EE concentrations with samples from Jeli the lowest (0.583%) and those from Kuala Krai the highest (2.03%).

Similar patterns were not observed in samples from other districts but whether there exist interaction between ash and EE concentration merit further investigation. The distribution pattern of Ca and P in the faecal samples was not in agreement with the ash values, reflecting large variations in the ratios of faecal Ca:P between and within districts. Excessive concentrations of P relative to Ca were observed in faecal samples from Kota Bharu and Tumpat districts in Kelantan, and Kuala

Terengganu district in Terengganu (Figure 6 and 7), but possible reasons are unclear.

It is evident that there wide variations in term of nutrient composition in faecal Swiftlets. Apart from variation in dry matter content which is mostly due to factors related to collection of faecal samples, the most important nutrient is crude protein. Attempt must be carried to clearly differentiate the content of true protein and non-protein nitrogen (NPN) in faecal swiftlets, more importantly in view of the linkages with ammonia and nitrate issues, both in the bird houses and the products (Kamarudin, 2012).

It is a known fact that organic fertilizer based on Switlets faeces are of high values and in most cases comparable to "guanos" in terms of nutritive value and cost. The issues are more on the aspect of supply. Comparatively, faecal wastes from birds are superior in terms of nutritive value as compared to those of ruminants and non-ruminant animals. Apart from N, P and Ca, other important minerals which determine the quality of fertilizer are K, Mg, Mn, Fe, Cu, Zn and boron (B); as well as the ratio of carbon (C): N (Table 4). The nutrient contents in the faecal matter are greatly depended on the type of feeds being consumed. Similar case is observed in swiftlets but type of their feed, possibly limited to small flying insects only (Nugroho *et al.*, 1998; DVS, 2007).

There are tremendous opportunities to exploit faecal Swiftlets as a high quality protein or nitrogen supplement to various species of livestock, including the aquaculture, apart from converting into normal fertilizer. Modern biotechnological techniques, including microbial and biodegradation processes, need to be considered if those product need to be value added for better returns. One of the important areas of interests has been on the production of high protein ingredients which are also rich in flavour and aromatic compounds for the aquaculture and pet animal industry. Flavour and aroma (including fragrance) compound synthesis by biotechnological processes nowadays plays a increasing role in the food, feed, chemical, pharmaceutical and cosmetic industries. This is mainly due to an increasing preference by the consumer for natural feed additives and other compounds of biological origin. Hence, faecal handling system and faecal collection method in Swiflet houses warrants further improvement if this by-product is to be efficiently utilized for income generation.

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