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SHAPING PATH FOR THE FUTURE

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PREFACE

The 2019 39th MSAP Conference carries the theme 'Livestock perspectives: Shaping the path for the future' in the midst of immediate and imminent challenges confronting national economies and civil societies. Foremost amongst these challenges are those associated with climate change, trade dispute, food security, digital economy and sovereign rights. Existing practices and economic approaches in food production are often being questioned as to their relevance in the new economy. Animal agriculture is partially blamed for global warming from methane emissions. Much are expected from industry driven new business models to ensure sustainable domestic food supply and flourish international food trade. Science based solutions may provide the basis of the new animal agriculture. To sustain the managerial pool to drive animal industries, attracting young entrepreneurs into animal agriculture is tougher than the other economic sectors if new technology based platforms are not forthcoming. How do we prepare young talents in acquiring new skillsets to address the shortcomings of present day production? Current producers are obliged to rework their strategies to stay competitive. Wagyu beef is being promoted in Dubai among non-traditional marbled beef consumers when its demand in Japan starts to dwindle due to economic slowdown. How do soverign states strategize when major economies are worried about loss of economic dominance and retaliated by upsetting trade flows? Researchers, members of the academia, producers and policy implementors gathered at this conference are in cognizance of these issues and are well aware of the dire needs to address them. In doing so we may contribute to some degree in shaping the path of future animal agriculture. The inclusion of a number of the papers on country updates in the livestock and feed industries and new insights in non-traditional food sources in the current MSAP Conference provides the necessary inputs to rethink our future directions in food security.

Editors
Scientific Committee of 39th MSAP Conference

The organising committee would like to thank all participants for the Abstracts submitted. However, due to the time constraint, it was not possible for the Editors to edit all the Abstracts thoroughly. The Editors are not responsible for any errors in the published Abstracts.

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Recent advances in buffalo research: The Philippine experience

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Abstract

The Philippine Carabao Center created in 1992 under the Department of Agriculture paved the way in the development of the water buffalo industry in the Philippines. The PCC's banner program, the Carabao Development Program (CDP), is a continuous and organized effort to increase the genetic potential of the native carabao for meat, milk and draft that would result to the development of buffalo-based and related enterprises aimed at increasing income and nutritional status of the farming communities. This comprises three component programs, namely, genetic improvement, carabao-based enterprise development and research for development. Recognizing the significance of more pragmatic applications of its research initiatives, PCC shifted its paradigm from R&D to R4D in 2013 emphasizing development as the endpoint of research. Priority researches are geared towards practical applications that directly benefit the water buffalo sector, the livestock industry and the smallholder buffalo farmers. Technologies developed are directed to increase productivity and profitability, which are translated into practical forms and best practices, changing the lives of carabao raisers transforming into "cara-entrepreneurs". These outcomes provide sustained income to farmers, improve nutrition of children, increase carabao population for utilization, and eventually, contribute to food security in the country. Current and future initiatives in R4D are addressing the gaps along the buffalo supply and value chains prioritizing acceleration of genomic gain through genomics and multi-trait selection, enhanced fertility and use of applicable biotechnologies to improve reproductive efficiencies and productivity, strategic reduction in mortality and enhance compliance to biosafety regulation, accelerating animal production through improved nutrition and practical feeding practices, development of innovative buffalo-based products and improved shelf-life, and socioeconomic implications of the CDP implementation, technology adoption and provision of policy support towards the expansion of carabao-based enterprises.

Is there any medicinal value in edible bird's nest?

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Abstract

Edible bird's nest (EBN) is one of the highly sought-after premium foods as it is believed to have nutritious and medicinal properties. However, there is limited literature and clinical evidence with regards to the alleged medicinal effects. In fact, much of the acclaimed effects are based on evidence on the substances found within EBN without translating the effect on clinical research. In our research, we wish to study the medicinal effects of EBN in terms of spatial memory/learning and also renal protection. EBNs were collected from seven different regions in Malaysia and were prepared as aqueous extract preparation via the process of double boiling, freeze drying, and enzyme digestion. Proximate analyses, microbiological and safety analyses were then conducted to ensure conformity to the local standard. In our study using the Morris water maze, rats treated with lipopolysaccharide (LPS) showed deficit in memory and the hippocampus of these animals had increased levels of interleukin 1-beta (IL-1β), tumour necrosis factor-alpha (TNF-α), and IL-6 compared to the control group. Pre-treatment with EBN significantly prevented this impairment induced by LPS and inhibited the production of these cytokines dose-dependently. This is shown by a dose dependent reduction in latency period and improvement in the target quadrant entries in the MWM model. In gentamicin-induced acute tubular necrosis (ATN) model, pre-treatment with EBN had shown protection of the renal cells from induced-acute tubular necrosis in a similarly dose dependent manner. Furthermore, the ability of EBN to protect the hippocampus from inflammatory damage and renal cells from the acute tubular necrosis may be attributed to the sialic acid. Pre-treatment of sialic acid significantly and preventively attenuated LPS-induced detrimental effects on systemic and renal haemodynamics, renal reactive oxygen species production and renal function, as well as, LPS-activated TLR4/gp91/Caspase3 mediated apoptosis signaling.

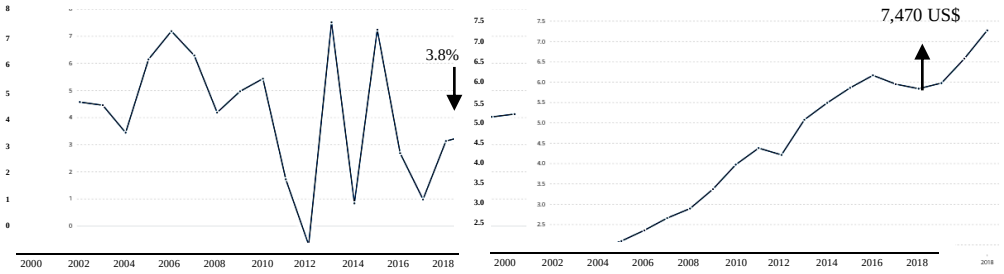
Thailand 4.0: Future of livestock and poultry industry in Thailand

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Abstract
"Thailand 4.0" is a new economic policy which Thai government aimed to move the country out of middle-income trap, economic disparities, and the imbalance between the environment and society. Thai agriculture is the main occupation of Thai population, but the production is low without direction to compete with the 21st century markets. "Agriculture 4.0" was announced in 2017 mainly to drive traditional agriculture into smart agriculture. In this case, adaptation to the GPP standards, as well as the appropriate technology and innovation are necessary for increasing production capabilities with market demand are need for small and medium scales of animal production sector. For the large animal production scale, research and development of new innovations are needed in order to compete in the international level. Nevertheless, green and circular production are demand for the 21st century Thai agriculture.

Introduction
"Thailand 4.0" is the Thai government's new economic policy aimed to pull the country out of the middle-income-trap, economic disparities, and the imbalance between the environment and society. This policy aimed to move the country toward the goals of stability, prosperity, and sustainability in the year 2032 (Government Public Relations Department, 2017; Poapongsakorn and Chokesomritpol, 2017). According to this policy, although agriculture is an important food production sector, but less tools and technologies applied in this sector. Thus, agriculture sector contributed for about 8 to 10% of total GDP which was approximately 3.8% per capita in 2018 (7,470 US$ per capita; Figure 1) (Work Bank, 2019), whilst almost 40% using human labour. Therefore, agriculture sector needs to adapt to modern concepts and technologies (FAO, 2017; Kasikornthai, 2017; Pugadmin, 2019).



GDP per capita growth (annual %) GDP per capital (current $US)

Figure 1. Thailand GDP between 1999 to 2018
Sources: World Bank (2019)

In order to achieve "Agriculture 4.0", the Ministry of Agriculture and Cooperative has established 10 long-term plan which are: (1) promoting farmers with easy access to information, (2) increasing the potential of producing agricultural products sufficient for domestic consumption, (3) discover and develop new innovations and technologies for agriculture, (4) solve the debt problems of farmers, (5) updated exiting regulations, (6) focus on large livestock production scale and more

attention for healthy food, (7) increase the value of Thai agricultural products, (8) adjust production in line with climate change, (9) increase research and innovation in agriculture, and (10) integrate all ministries and experts to cover all aspects related to agriculture (Ministry of Agriculture and Cooperative, 2019). Since this policy was strongly announced by the government, all agricultural sectors, including livestock and poultry, have to adjust themselves to the new direction. This paper aims to present some information relate to the future livestock industry of Thailand under agriculture 4.0 policy.

Livestock and poultry population and trends

In Thailand, chicken, duck, and swine are three mains important in animals that contributes more than 80% of livestock and poultry production income. This means that consumption of chickens, ducks, and pork are popular among the majority of Thais. This is due to the most of them are Buddhist, and some of them do not want to consume large ruminants. Unlike goat and sheep, meat from these small ruminants are not popular among Thai consumers because goat and sheep meats are not commonly part of the originally Thai meal (Wattanachant, 2008). Based on the previous information, the total number of chickens, duck, and swine raising are higher (98% vs. 2%; Figure 2), and had more economic contribution in Thai livestock industry than the ruminants. However, during 2014 to 2018, ruminant population increased by 30% while the non-ruminant had approximately 18.3% increased (Table 1). The increasing number of ruminants, particularly, goat, cattle, and buffalo reflect the raising in the demand for domestic and neighboring countries (China, Laos, and Vietnam) markets (Nimsai et al., 2015), but chicken and pork are the two main exported products from Thailand (Department of Livestock Development, 2019). This is because chicken and swine production are running by large companies. Nevertheless, demand of animal protein for Thai consumers' trend to increase due to the growth of urbanization (Office of the National Economic and Social Development Council, 2019).

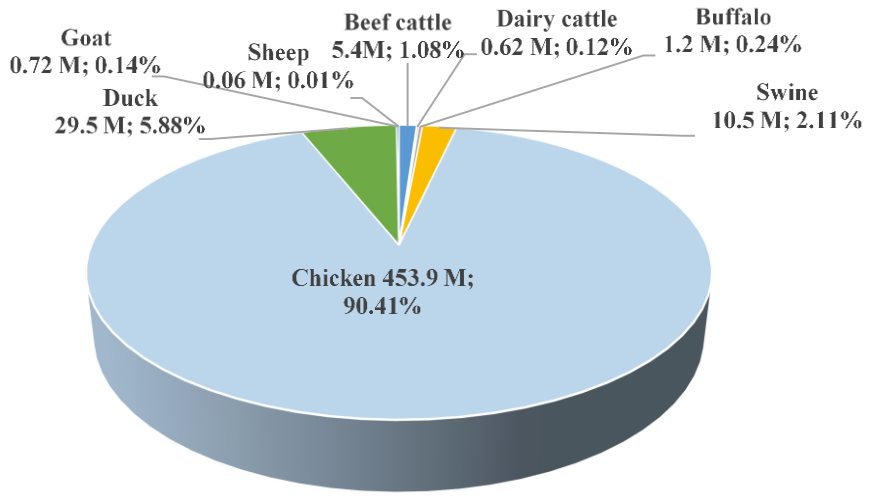


Figure 2. Livestock population in Thailand in 2018
Source: Department of Livestock Development (2019)

Table 1. Livestock and poultry population in Thailand from 2014 to 2018

Year	Beef cattle	Dairy cattle	Buffalo	Swine	Chicken	Duck	Goat	Sheep
2014	4,312,408	508,548	840,064	9,504,921	380,936,668	27,235,334	468,377	43,901
2015	4,407,108	509,524	888,431	9,886,897	418,330,613	28,762,259	539,583	49,448
2016	4,876,228	584,327	1,029,924	10,191,784	429,979,458	26,287,094	652,964	53,228
2017	5,160,790	603,877	1,105,474	10,389,544	441,984,339	27,908,363	686,418	54,524
2018	5,445,351	623,427	1,181,023	10,587,303	453,989,219	29,529,631	719,872	55,820
%change	26.3	22.6	40.6	11.4	19.2	8.4	53.7	27.2

Source: Department of Livestock Development (2019)

In terms of ownership and raising technology, most of the cattle, small ruminant, and native chicken farming in Thailand is owned by individual farmer, or small and medium-sized enterprises that use simple tool and technology, while the majority of poultry and swine including feed manufactory are in the hands of large companies that use a modern technology. But when entering in the 21st century, small scales using native animals and /or raised by natural systems are not much affected when compared to large-scale production. For example, raising native animal such as chicken, cattle and goat will still be privilege food for community level and will generate income at the community level, although native beef and small scale of dairy cattle including goat may be more affected than native chickens if they do not adapt to niche production (Reodecha, 2012).

Agriculture 4.0 and Thai livestock and poultry industry

Certainly, agricultural policy 4.0 is being driven seriously to increase the opportunity for agricultural production in the country to produce quality products for the 21st century markets. However, various adaption needs to be done by all producer. In this paper the author divided the term of adaptation into 2 levels according to the capacity of business scale, which are:

(1) Adaptation of small and medium scales: for this group, the government must accelerate the GAP standard and establish effective traceability systems; supporting farmers to produce high value products or niche products; supporting farmers to work together in a form of networking, develop agricultural information for farmer decision; develop short-course or training programs that enhance farmer knowledge and experience, develop suitable technologies and innovations; and encourage green and circular economy.

(2) Adjustment of large scales: due to this group has business capability and has already adapted into agriculture 4.0. Therefore, to face with the 21st century, new innovations-artificial intelligence such as robots for production control, improve animal yield and nutritional quality via new genomic technologies, develop suitable farming processes which safety and environmentally friendly awareness.

Nevertheless, under Thai Agriculture 4.0, the small and medium animal production scales need to change from very traditional production system to smart farming system. This production level needs more support from the government. In addition, human health, ethic and socio-culture need more concern from all production scales.

Conclusion

Agriculture 4.0 is an opportunity for Thai livestock and poultry production industry to adapt itself to produce food protein products that valuable, safe and with quality for the society. Under this policy, small and medium animal production scales need to adjust the way of production system from traditional to smart and precision system that could be done by applying an appropriate technologies and innovations including new knowledge for farmers. For the large-scale production, under "Agriculture 4.0", science and technology for new animal breeding and management systems is need to be concerned, whereas green and circular production are the demand for the 21st century Thai agriculture.

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Challenges in the Malaysian poultry industry

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Abstract

The Malaysian poultry industry is a self-sustaining industry providing food security on a valuable and popular source of animal protein. Malaysia is self-sufficient in poultry products (SSL of 105% for poultry meat and 123% for eggs). Malaysia has one of the highest per capita consumption of poultry meat and eggs in the world. The products are readily affordable to consumers, and the prices in Malaysia are one of the lowest in the ASEAN region. Some of the challenges facing the industry are price volatility, misconceptions on the cost of production and ex-farm prices, land issues which inhibit the adoption of closed-house systems. The poultry industry has good prospects for increased production for exports.

Introduction

The poultry industry has been growing steadily over the past thirteen years at an average rate of 5% per annum (Figure 1). Malaysia is self-sufficient in poultry meat (105%) and eggs (123%). The surpluses are mainly exported to Singapore. This is in stark contrast to the self-sufficiency levels of beef (23%) and mutton (11%).

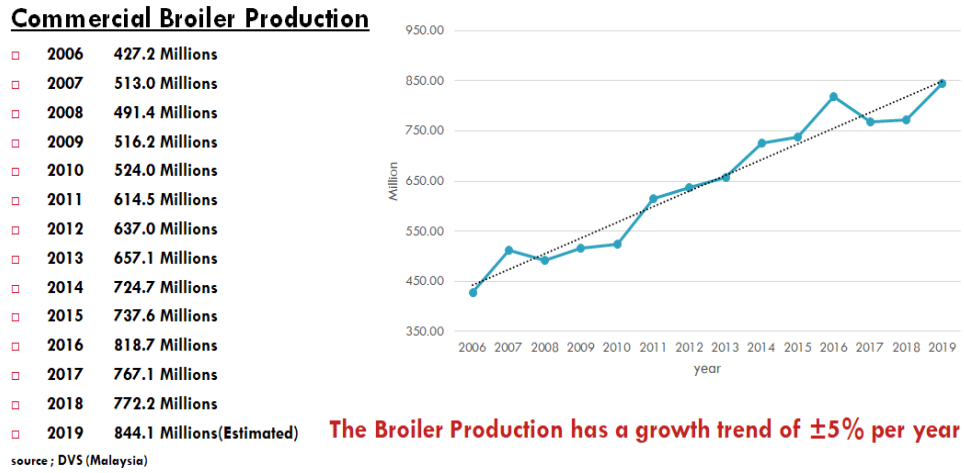


Figure 1. Annual growth of poultry production in Malaysia from 2006 to 2019

The per capita consumption of chicken meat (51.5 kg) and eggs (338) in the country is higher than the other meats where beef is 6.5kg, mutton 1.3kg and pork 16.6kg. The per capita consumption of poultry meat in Malaysia is one of the highest in the world. The local poultry production has created job opportunities in the country from feed-milling to farming, and to many transporters, harvesters, wholesalers and retailers. The poultry industry has over 3,000 farms in the country with an ex-farm value of over RM 10 billion in 2017. The export value of the poultry products was about RM583.94 million in 2018. In contrast beef, mutton and dairy products importations had resulted in a loss of foreign exchange. Poultry meat is the most affordable meat in the country, consumed by all races in the country. For the last five years the ex-farm broiler prices had ranged from RM3.50 to RM5.90 per kg, with a mean of RM4.75/kg. The Grade C egg price is also fluctuating within a range from 29.5 to 34 sen per egg. In contrast the price of local beef was RM23/kg in 2013 and this has escalated to RM32/kg in 2019. Even imported buffalo

meat from India is currently retailed at RM17/kg. The prices of fish and vegetables have also escalated significantly over the last two decades. The ex-farm prices of broiler and eggs are amongst the lowest prices in the neighbouring ASEAN countries (Figures 2 and 3).

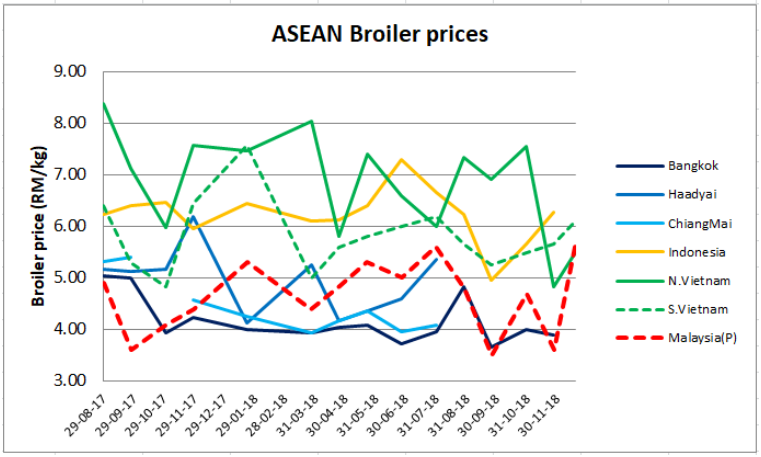


Figure 2. Malaysian broiler prices compared to those of other ASEAN countries (2017-2018)

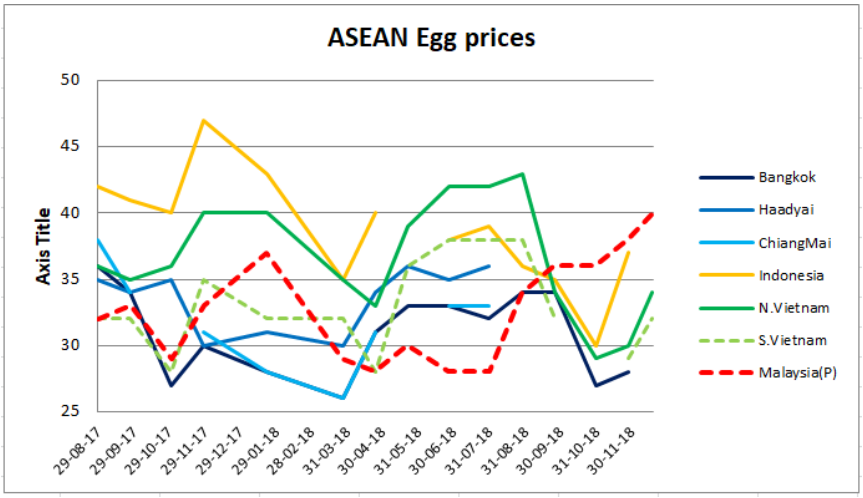


Figure 3. ASEAN egg prices (grade C eggs – sen/egg) – 2017 to 2018

This ability to supply chicken meat and eggs is made possible because of the initiatives of the poultry farmers. They have invested into the industry with injections of financial capital, knowledge and technology. Malaysia has all the best poultry breeds that are available in the world. The industry has adopted the latest technology in the poultry supply chain from feed milling, breeder farms, hatchery, broiler grow-out farms and downstream to poultry processing with further processing. This has provided a good food security net for the country.

Current challenges to the Malaysian poultry industry

Myths about the poultry industry's deliberate interventions in production and selling prices

There are still some misconceptions about the volatility of poultry prices (Figure 4). Every time when the ex-farm price of broilers or eggs increases it is perceived as an unjustified increase, even suspicion of profiteering, price syndication, and deliberate creation of shortages. This has prompted the government to impose ceiling prices, especially during festivities and proposals to curb export of live chickens and eggs to Singapore.

The Malaysia Competition Commission (MyCC) had in their report, "Review of Domestic Broiler Market: Final Report" issued on 21 March, 2014, concluded that "there is little avenue for any active or tacit collusion in the production and supply of broiler chickens up to the farm gate, and there is no horizontal arrangement between farms to fix the ex-farm price or even restrict supply to raise the same".

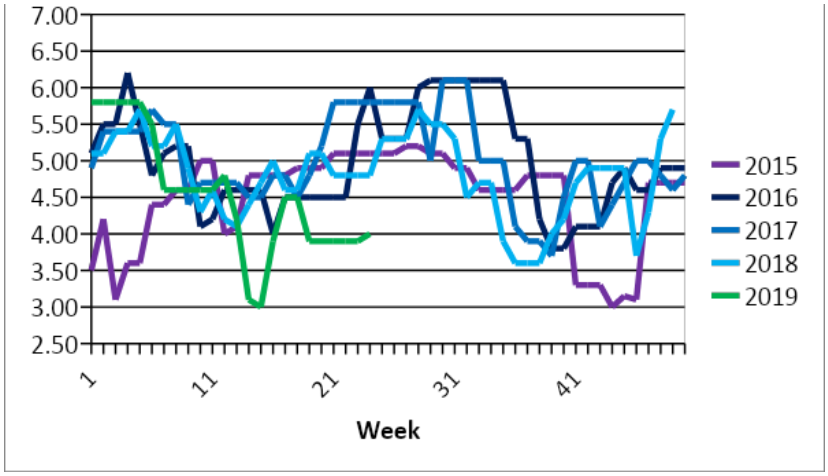


Figure 4. Weekly ex-farm broiler prices (2015-2019) RM/kg (Source: DVS)

Over the years it has been demonstrated that poultry prices fluctuate within a narrow band of a supply-demand curve. There is a moderate correlation between production level and broiler prices in the market as in any business according to 'supply and demand' factors in the market.
MyCC in the same 2014 Report mentioned above, had also stated that "the retail prices of broilers had increased by about 7.5% for every 10% increase in the ex-farm price of live broilers. But the retail price was unlikely to drop immediately whenever there is a drop in the ex-farm price". As such, consumers do not always benefit from the drop in the ex-farm live bird prices, and this possibly prolongs the glut situation at the farm level, resulting in losses to the producers. Any effort in this area will help to boost consumer consumption of the low-priced chicken and reduce the glut situations in the country. While the government has established ceiling prices it has not established any floor prices, and prices in the non-festive seasons can drop well below production costs.

Lack of understanding on the factors affecting Cost of Production (COP)

A lack of understanding of the factors affecting COP has resulted in a belief that poultry producers are making excessive amount of money at the expense of consumers. The cost of production is influenced by many external and internal factors. The external factors include prices of imported corn and soya bean meal which make up for the bulk of cost ingredients (90-95% of feed cost). Feed cost constitutes up to 70% of the poultry production cost. Broiler prices lag feed price changes by 1-2 months. The internal factors include chicken feed conversion ratio (FCR), mortality and product quality, and farm expenses such as labour, utility, vaccines and medicine. FCR and mortality are influenced by the many challenges from nutritional quality of the feed grains to poultry diseases, and lapses in the implementation of Good Agricultural Practices.

Lack of a clear land policy for livestock farming in the country

While the government has encouraged the farmers to improve and increase food production for the purpose of food security, unfortunately to-date there are no provisions for gazetting land to be used for poultry farming. Land suitable for poultry farming is a primary problem for farmers, for both existing farms and new farms.

A very challenging requirement from the government authorities (Municipal Councils) is the requirement of 'Kebenaran Merancang' (KM) or Planning Approval for the construction of poultry farms, under the Town and Country Planning Act. Application for KM is time-consuming and a costly affair. Currently, some states classify the land for poultry farming as "Industrial" which carries a high premium for the license. The conditions required under KM, especially on the requirements of buffer zone, differ from state to state.

The importation of poultry frozen chicken parts and boneless chicken meat

The government has permitted the importation of frozen chicken parts and boneless chicken meat into the country. The Department of Veterinary Services (DVS) allows for the imports of cut chicken parts to be used by the further processing industry. The importation of these poultry products is on an increasing trend. The importation of poultry parts from countries like China and Thailand also poses a challenge to the growth of down-stream processing in the industry to produce cut-up parts and boneless meat.

The poultry industry can perform better

Malaysia has good halal credibility as established by JAKIM. Malaysia has been recognised as a champion of the Global Islamic Economic Indicator by the Dubai Islamic Economy Development Centre in its Global Islamic Economy Report released in October 2018. The government should take all measures to facilitate the export of poultry products, tapping into the USD 3 trillion global halal market. Many poultry companies in the country have initiated such moves including making substantial investment in facilities and establishing strategic overseas partners. However, for competitiveness in the export sector the industry will also need a healthy market base in the home country. At the same time export will help the industry reduce its over-dependence on a saturated local market, thus helping the industry gain economies of scale, improve productivity and product quality.

Thailand has been very successful in the export of poultry products. It has benefited from a successful "Public-Private" partnership between the government authorities and the industry. Malaysia should study and emulate our neighbour, Thailand, in encouraging a production economy for exports.

Mitigating enteric methane emission from livestock by plant secondary compounds

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Abstract

The emission of greenhouse gases such as carbon dioxide and methane is considered as one of the most important global environmental issues. Livestock, particularly ruminant, produce methane from anaerobic fermentation in their gastro-intestinal tracts and therefore contribute to global warming. This paper aims to elaborate findings related to the effects of plant secondary compounds, i.e., tannin and saponin for mitigating enteric methane emission originated from livestock. Forage plants containing substantial concentration of tannins had low methane production when incubated *in vitro* with buffered rumen fluid. Such fact is true for forage plants across a diverse geographical and climatic regions. Tannin content was negatively correlated with methane emission, and both forms of tannins (consensed tannin and hydrolysable tannin) contributed to the decrease of methane emission. A meta-analysis study from published literatures revealed that tannin reduced enteric methane emission from both *in vitro* and *in vivo* experiments. Such response is contributed from a reduction in nutrient digestibility, an increase of propionate proportion, a direct inhibitory effect on the methanogens, and a decrease in protozoa population. With regard to saponin, the *in vitro* incubation of saponin-containing plant materials increased the reduction in methane production. Another meta-analysis study revealed that increasing the level of a saponin-rich source decreased methane emission per unit of substrate incubated with a curvilinear pattern. Such methane decrease by saponin was accompanied with a decrease in acetate proportion, an increase in propionate proportion, and a reduction of protozoal population. Both triterpenoid and steroid saponin forms are effective in mitigating methane emission. It is concluded that the presence of tannin and saponin in forages is able to mitigate enteric methane emission originated from ruminant livestock.

Introduction

The emission of greenhouse gases such as carbon dioxide and methane is considered as one of the most important global environmental issues. Livestock, particularly ruminant, produce methane from anaerobic fermentation in their gastro-intestinal tracts as a pathway for the disposal of metabolic hydrogen produced during microbial metabolism. Ruminant livestock are responsible for about 15 to 20% of the total anthropogenic emission of methane (1). Compared to all greenhouse gases, methane is the second most important after carbon dioxide in terms of total emission, and the ability of methane to retain heat is 21 times higher than carbon dioxide (2). The methane produced from enteric fermentation of ruminant is not only related to environmental problems, but also associated with energy loss and hence, decrease in their energy utilization and retention. Typically, 6 to 8%, but up to 12% of the gross energy (GE) in feed is converted to methane during microbial digestion in the rumen (3). Therefore, decreasing methane production from ruminants is desirable for reducing the greenhouse gas emission and increasing utilization of the digested energy. The plant secondary compounds (PSC) have been suggested as effective alternatives to antibiotics to suppress ruminal methanogenesis through their antimicrobial activity. Plant secondary compounds constitute the group of chemicals present in plants that are not involved in the primary biochemical process of plant growth and reproduction. The potential of

these compounds specifically tannin and saponin to reduce enteric methane production has been recognized. The antimicrobial action and effects on rumen fermentation of these compounds depend on their nature, activity and concentration. This paper aims to elaborate findings related to the effects of PSC, i.e., tannin and saponin for mitigating enteric methane emission originated from livestock.

Tannin and Methane Emission

Jayanegara et al. (4) conducted a screening from 27 tropical forage species to obtain low methanogenesis forages. The methane/total gas ratio was lowest with *Swietenia mahagoni* (68 ml/l). Other plants, which resulted in <100 ml methane/liter of total gas, were *Acacia villosa*, *Eugenia aquea*, *Myristica fragrans* and *Pithecellobium jiringa*; all of these plants contained considerable amounts of tannins. In that respective study, tannin content was negatively correlated with methane emission ($r = -0.74$, $P<0.001$). Both the condensed tannin (CT) and the hydrolysable tannin (HT) fractions contributed ($P<0.01$) to the decrease of methane/digestible organic matter (OM) (both $r = -0.60$). Similarly, using 17 tannin-containing plants collected from Mongolia, negative relationships between total phenol, total tannin or tannin activity and methane production existed (5). A meta-analysis study had been conducted to elucidate the effect of dietary tannin on enteric methane emission from both *in vitro* and *in vivo* experiments (6). The data were originated from 15 experiments (130 treatments) for the *in vitro* and also from 15 experiments (41 treatments) for the *in vivo*. Methane emission, both when expressed as ml/g substrate and ml/l total gas production, decreased (both at $P<0.001$ in linear equations) with increasing levels of dietary tannin with R^2 of 0.39 and 0.40, respectively. Although methane/digestible OM also decreased ($P<0.001$), the pattern followed a quadratic response rather than a linear relationship with an R^2 of 0.66. Emission of methane per unit of metabolic body weight decreased as the dietary tannin increased ($P<0.05$, $R^2=0.36$). The relationship was closer when methane was expressed per unit of dry matter intake ($P<0.01$, $R^2=0.47$). There was a decrease of methane per digestible OM with increasing level of dietary tannin ($P<0.05$, $R^2=0.29$).

Mechanism by which tannin reduces methanogenesis partially appears to be due to a concomitant decline in digestibility of nutrients. The latter is the result of complexes formed by tannin with proteins and carbohydrates under ruminal pH conditions (7). Fiber appears to interact with tannin through hydrogen bonds formed with the large number of free phenolic groups. Any reduction in fiber degradation is likely to reduce methane formation because fibrolysis delivers H_2 as a substrate for methanogenesis in forming acetate from pyruvate. Additionally, an increased propionate production from pyruvate consumes H_2 and thus should lead to even lower methane amounts (1). Apart from indirect effect via a reduced ruminal nutrient degradation, tannin may have a direct inhibitory effect on the methanogens. It has been previously reviewed that pyrogallol, gallic acid and tannic acid, which are among the monomers of tannins, are toxic for methanogens. Further, Bhatta et al. (8) reported that tannin suppressed the total population of methanogens *in vitro* by on average 12% when incubated with 130 to 185 g HT/kg DM and by 29% when incubation with 53 to 113 g mixed HT and CT/kg DM when compared to polyethylene glycol treated controls. This tannin affects specifically *Methanobrevibacter ruminantium*, an important ruminal methanogen species. Tannin also reduces protozoa population in the rumen (8) which is a major H_2 producers that host a certain proportion of the methanogens, and this association of protozoa and methanogens therefore contributes to methane emission. Therefore, a reduction in protozoal count may explain effect on methane emission as well.

Saponin and Methane Emission

The *in vitro* incubation of saponin-containing plant materials, i.e., leaves from Sesbania (*Sesbania sesban*) or seeds of Fenugreek (*Trigonella foenum-graecum* L.) as a sole substrate

resulted in higher responses towards increasing the partitioning factor (increasing efficiency of microbial mass synthesis) and increasing the reduction in methane production (9). These plant materials when supplemented to hay or concentrate based diets, did not produce substantial reduction in methane production. The higher partitioning factor and methane reduction were observed when the saponin-containing plant materials were supplemented to concentrate based diets. All different incubation materials: the sole plant material, plant material supplemented with hay or concentrate based diets or the plant extracts resulted in reduction in protozoal population (9).

Jayanegara et al. (10) performed a meta-analysis study regarding the effect of saponin on ruminal methanogenesis by integrating 23 experiments from 18 articles. The results revealed that increasing the level of a saponin-rich source decreased methane emission per unit of substrate incubated with a curvilinear pattern ($P<0.05$). Saponin-rich source had little effectiveness in decreasing the respective methane parameter when added at approximately above 500 mg/g DM. When methane was expressed as ml per 100 ml total gas produced, increasing levels of the saponin-rich source decreased methane linearly ($P<0.001$). Such methane decrease by saponin was accompanied with a decrease in acetate proportion (linear pattern; $P<0.05$) and an increase in propionate proportion (linear pattern; $P<0.001$) from the total short-chain fatty acid. Furthermore, log protozoal population decreased ($P<0.05$) at higher saponin levels. Comparing between different saponin-rich sources, all saponin sources appeared to produce less methane than the control (10). However, when methane was expressed as ml methane produced per unit of incubated substrate, only yucca saponin had significantly lower methane than control ($P<0.05$), while quillaja and tea saponins were not different. But when methane was expressed as ml methane produced per 100 ml total gas, all saponin sources, i.e. quillaja, tea and yucca saponins produced less methane than that of control ($P<0.05$).

Despite the large structural diversity of saponin among various plant sources, it appears that there is a genuine effect of increasing levels of saponin-rich source addition in mitigating ruminal methane emissions. Part of the explanation that saponin decreases methane emission is due to a lower relative abundance of the methanogen population in the presence of the respective substances in the rumen (11). Apart from a decrease in methanogen population, saponin may also hamper the activity of methanogen per unit of methanogen cells. Further, protozoa provide hydrogen as a substrate for methanogenesis conducted by the methanogens. Therefore, a reduction in protozoa population (defaunation) may lead to a decrease in methanogen population and, subsequently, methane emission as well. Inhibition of cellulolytic bacteria and anaerobic fungi that degrade fibrous materials by the presence of saponin leads to further decrease of hydrogen supply which in turn it contributes to lower methane emission.

Conclusion

Presence of tannin and saponin in forages is able to mitigate enteric methane emission originated from ruminant livestock. These natural plant secondary compounds may decrease such greenhouse gas emission either as tannin- or saponin-containing forages as well as when added as feed additive extracts. Both hydrolysable and condensed tannins contribute to the methane abatement, and this is also true for triterpenoid and steroid saponins. However, their concentrations in diets should not be excessive (less than 2% DM) in order to prevent negative effects on livestock productivity and health.

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Processing technology, product development of sea cucumber internal organs as hydrolysate peptides in animal nutrition feed supplement and the agro-based food industry

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Introduction

Malaysia is well known in Asia Pacific as a producer of premium value-added seafood products, such as Abalones, Sea Cucumbers and Lobsters, for domestic and overseas market; exporting to East Asia, Australia, New Zealand, North America and Europe. In recent years, due to high demand of such seafood products worldwide, local resources have become scarce, and many of these items had to be outsourced from other countries in the Asia Pacific, etc. Among the seafood items, Sea Cucumbers are one of those popular seafood products in the Chinese community, fetching with reasonable high pricing. But, a major issue with Sea Cucumber, is the waste generated in the process, resulting up to 30-40% waste in the form of visceral organs, which, if the waste is not managed properly, it might pose as environmental issue to the community, such as causing pollution and contamination. Sea Cucumber internal Organs (SCiO) and washed water, containing soluble components are usually discarded as waste in the industry, has considerable amount of nutritional components. A preliminary study by Universiti Kebangsaan Malaysia (UKM) research team recently discovered that, on dry weight basis, the SCiO contains 50.27% and 22.16% of protein and fat contents, respectively. In order to evaluate the potential benefits on the nutritional quality of the SCiO, researchers from UKM in collaboration with Agridon Technologies have developed an efficient biotechnology process of using selective enzymes to hydrolyse the internal organs, converting insoluble visceral organs and connective tissues into highly functional and nutritious components, using optimum conditions to obtain high yield of SCiO. Subsequently Amino Acids Profile (AAP), Fatty Acids Profile (FAP), microbiology quality, soluble minerals and peptides of the various components obtained from the processing steps, i.e., hydrolysis, filtration, membrane separation, concentration and finally spray drying and/or freeze drying of the SCiO were determined.

Materials and Methods

Sea cucumber internal organs (SCiO) was provided by Harmony Marine Products Sdn. Bhd., Pasir Gudang, Johor, Malaysia. Two enzymes were used, i.e. Alkaline Protease ST and Exopeptidase ST purchased from Science Technics Sdn Bhd, Klang, Selangor, Malaysia.

Enzymatic Hydrolysis of SCiO

SCiO was cut into smaller pieces to increase the surface area for the enzymatic hydrolysis process. The SCiO was adjusted to approximately 20% total solids with water, and pH adjusted to pH 8 with sodium hydroxide. Temperature was set at 60°C, and added 1% of the Alkaline Protease ST enzyme, and held for 3 hours with stirring. Subsequently, 0.5% of Exopeptidase ST enzyme was added and kept at 60°C for 18 hours with stirring. The insoluble fractions were filtered off, and the filtrate was refrigerated at 4°C to allow fat separation. The separated fat (on the surface) were scooped out from the samples, to obtain the SCiO oil. The liquid was spray dried to produce SCiO hydrolysates in powder form.

Physicochemical Characterisation of SCiO Hydrolysates

The solubility (total soluble solids), water activity, and the proximate compositions of SCiO Hydrolysates were determined (AOAC 1990).

Amino Acid Profiling

Amino acid profiling of SCiO hydrolysates was conducted using 3 different hydrolysis methods (acid, performic acid, and alkaline), and subsequently injected into HPLC for separation. Appropriate standards were used to identify and quantify the amino acids present (Ali et al. 2019).

Fatty Acid Profiling

Fatty acid profile of SCiO oil was determined using the fatty acid methyl ester (FAME) method, coupled with GC-FID (IUPAC 1987). The fatty acid present, together with its amount were identified using appropriate standards.

Microbiology Profiling

Microbiology profile of SCiO hydrolysates was performed according to method of Food and Drug Administration (FDA): Bacteriological Analytical Manual Online 2012, 2013, 2016 and method ISO 6779-1: 2017. The microbiological analyses performed were total plate count, coliform, *E. coli*, *S. aureus*, *Salmonella* spp., and yeast and mould.

Results and Discussion

Recovery of SCiO Hydrolysates

On dry weight basis, approximately 6 kg of SCiO was utilised for the enzymatic hydrolysis, of which 5.83 kg of spray dried SCiO hydrolysates powder was produced. This translate to 97% recovery of the SCiO hydrolysate. Simultaneously, 140 g of SCiO oil was produced, which translates to approximately 2.4% recovery of the oil. All in all, these figures were very convincing, and thus, translating to a very sustainable model, in which negligible waste were produced.

Physicochemical Characteristics of SCiO Hydrolysates

The major compositions of SCiO hydrolysates was protein and fat, at 49.4% and 24.2% respectively, as shown in Figure 1. This is consistent with the preliminary work performed, where the raw SCiO contains 50.27% and 22.16% of protein and fat respectively. This shows that the enzymatic hydrolysis did not alter the nutritional properties of the SCiO.

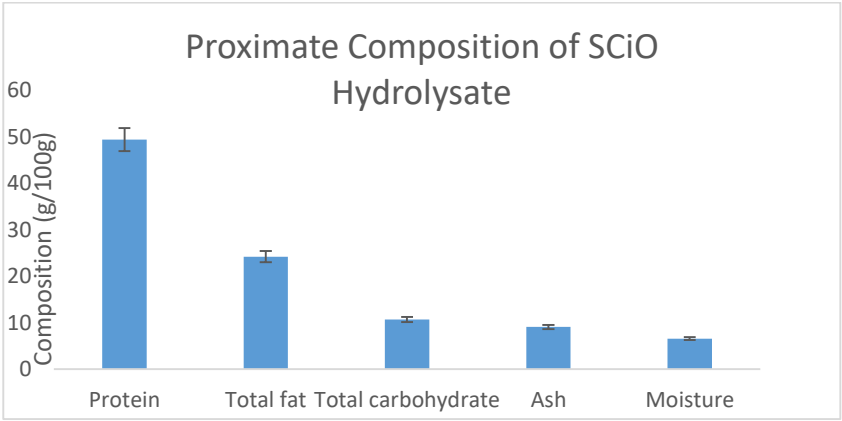


Figure 1: Proximate composition of SCiO hydrolysates

Aside from that, Table 1 show that the water activity of the SCiO hydrolysates were very low, at 0.35±0.004, compared to that of the raw SCiO, at 0.57±0.001. The decrease in the water activity is due to the spray drying process, which produces a powder with very high stability. The total solubility of the SCiO hydrolysates also increased to 66.4%, from 42.9% of the raw SCiO. The increase in solubility was attributed to the enzymatic hydrolysis performed, where proteins were hydrolysed into peptides and amino acids, which in turn, are more soluble in water.

Table 1: Water activity and total solubility of the raw SCiO and SCiO hydrolysates

Samples	**Water activity (A_w)**	**Total solubility**
Raw SCiO	0.57 ± 0.001	42.9%
SCiO hydrolysate	0.35 ± 0.004	66.4%

Amino Acid Profile

Overall, SCiO hydrolysates contains all the 9 essential amino acids, which corresponds to 36.65 ± 0.06 % of the total amino acids present, as shown in Table 2. Among the major amino acids were glutamic acid (7.36 ± 0.02 %), aspartic acid (5.64 ± 0.03 %), arginine (5.24 ± 0.02 %), leusine (4.24 ± 0.01 %) and threonine (4.19 ± 0.04 %). Based on recent studies reported on visceral hydrolysates of Abalone and sea cucumber, the peptides and glycopeptides exhibited high antioxidant activities and showed potential functional role in reducing hypertension (Pangestuti & Arifin 2018; Mamelona et al. 2010; Yan et al. 2016; Park et al. 2015).

Table 2: Amino acid profile of SCiO hydrolysates (n=2)

Amino acids	**Amount (g/100g)**
Hydroxyproline	0.21±0.01
aspartic acid	5.64±0.03
serine	3.59±0.02
glutamic acid	7.36±0.02
glycine	4.22±0.03
histidine*	1.24±0.02
arginine	5.24±0.02
threonine*	4.19±0.04
alanine	2.18±0.03
proline	2.75±0.01
thyrosine	2.06±0.02
valine*	2.36±0.01
methionine*	1.08±0.02
lysine*	1.11±0.01
isoleusine*	2.15±0.01
leusine*	4.24±0.01
phenylalanine*	2.23±0.01
tryptophan*	0.65±0.01
cysteine	0.01±0.01
Total	**52.52±0.25**

*essential amino acids

Fatty Acid Profile

SCiO oil contains 39.76 ± 0.29 % saturated fatty acids, 26.86 ± 0.01 % monounsaturated fatty acids, and 33.39 ± 0.28 % polyunsaturated fatty acids, as shown in Table 3. Interestingly, the Omega-3 eicosapentaenoic acid (EPA) (C20:5n3), an essential fatty acid, was found to be the major fatty acid of SCiO hydrolysates, amounting to 27.60 ± 0.14 % of total oil content. This corresponds to approximately 6.5-7.2% of the SCiO hydrolysates being EPA, which is high and valuable, especially coming from a waste material. Among others, EPA, together with docosahexaenoic acid (DHA), has been associated with foetal development, cardiovascular function, and Alzheimer's disease (Swanson et al. 2012).

Table 3: Fatty acids of SCiO oil (n=2)

Fatty acids	**Saturated fatty acids**	**Monounsaturated fatty acids**	**Polyunsaturated fatty acids**
SCiO Oil	39.76 ± 0.29 %	26.86 ± 0.01 %	33.39 ± 0.28 %

Microbiology Profile

The microbiological quality of the SCiO hydrolysates is shown in Table 4. The results were compared with the microbiological guidelines or standards imposed by Ministry of Health (MOH) Malaysia and the other international standards. The total plate count, coliform, *E. coli*, *S. aureus*, *Salmonella* spp., yeast and mould counts of the SCiO hydrolysates were within the acceptable limit (Act 281 2001; FoSIM 2000; ICMSF 1986). The microbial load and the presence of pathogenic microorganisms in food will reflect the food hygienic quality and the associated potential health hazards (Hoque et al. 2015). Thus, the microbial counts within the acceptable limit is important to make sure the food products are safe for consumption.

Table 4: Microbiology counts of SCiO hydrolysate (n=2)

Colony count	**Amount**
Total plate count (CFU/g)	3.1×10^2
Coliform (MPN/g)	< 3
E. coli (MPN/g)	< 3
S. aureus (MPN/g)	< 3
Salmonella spp. in 25 g	Absent
Yeast and mould (CFU/g)	1.5×10^2

CFU = colony forming unit
MPN = most probable number

Conclusions

The enzymatic hydrolysis process has successfully convert the SCiO waste material into a potential product in animal nutrition feed supplement and the agro-based food industry. Two major components were derived from the SCiO, i.e. the SCiO hydrolysates and the SCiO oil. The application of these functional products as animal nutritional feed supplement, functional food ingredients, nutraceutical and pharmaceutical applications are being studied now. Ultimately, this research have the potential to convert the waste material into high-value products and safe for consumption, which in turn, enhances the economic value of SCiO and the related industry.

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The bodyweight of Boer goats is highly heritable but reduced by gastrointestinal nematode infection

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Abstract

This study aimed to explore the relationship between bodyweight of Boer goats and gastrointestinal nematode infection. Faecal samples were collected per-rectum from 158 goats in a farm in England once every four weeks from August to October 2014 for faecal egg counts (FEC). Pedigree data information was also collected from the farm. In each month, all goats were weighed prior to sampling and drenched after the sampling. Bodyweight appeared to increase from August to October with significant differences found between months (Kruskal-Wallis = 44.337, df = 2, $p<0.001$). Spearman correlation analyses showed that a lower bodyweight in each month of sampling was associated with a higher FEC in August ($r=-0.34$, -0.36, -0.33; $p<0.001$). Bodyweight also showed high correlations among pairs of months (0.83, 0.89, 0.91; $p<0.05$). The effect of FEC on bodyweight was then explored using repeated measure mixed models using MCMCglmm in R. Month of sampling, FEC and their interactions were fitted as fixed effects. Goat ID was treated as a random effect to estimate individual variation (Model 1). The additive genetic effect for each goat was added as another random effect termed 'animal' to estimate bodyweight heritability (Model 2). Model selection was conducted by removing the least significant fixed effects until arriving at the simplest model. In both models, the month of sampling was associated with differences in bodyweight ($p<0.001$). Additionally, as the FEC increased, the bodyweight decreased. Bodyweight heritability was high at 0.90. In conclusion, gastrointestinal nematode infection reduced bodyweight but overall much of bodyweight variation among Boer goats in this study resulted from additive genetic effects.

Influencing factors of artificial insemination usage among dairy cattle farms in Selangor

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Abstract

Artificial Insemination (AI) is one the most important assisted reproductive technique utilized in livestock breeding to improve genetics and production. Despite a remarkable success achieved with the use of AI in most developed countries, its impact in developing countries remains limited. The present study was conducted among dairy cattle farms in Selangor to determine the percentage of farms that practice AI in their breeding program as well as to identify factors that influence its adoption. A questionnaire based survey which consisted of 39 questions constructed into different categories and distributed to 50 dairy cattle farms was conducted. A Chi square and Kruskal Wallis test were used to determine the level of association between the variables. Results showed that out of 50 dairy cattle farms, 27 (54%) were using AI as part of their breeding program. Among the factors assessed, 9 of them were found to significantly influence AI usage in dairy cattle farms. These include: preference (P=0.01), education level (P=0.04), experience (P=0.05), awareness on AI services by Department of Veterinary Service (P=0.04), technician availability (P=0.01), technician adequacy (P=0.01), farm establishment years (P=0.02), record keeping practice (P=0.01) and pregnancy success rate (P=0.01). In conclusion, the study revealed that the proportion of dairy cattle farms using AI in their breeding program is slightly higher (54%). The implementation of AI by the farms found to be significantly influenced by inseminator, farmer, farm and animal factors, and effort needs to be made against these factors to enhance AI coverage among dairy farms.

Health performance and blood profile changes in commercial broilers supplemented with dietary monocalcium phosphate

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Abstract

Fast-growing broilers faced with various leg health problems are in crucial need of an adequate nutritional supply of both calcium and phosphorus. The aim of the current work was to study the effect of different level of monocalcium phosphate supplementation on the health performance, haematology, and biochemistry changes of commercial broiler chickens. A total of 108 broiler birds (Cobb 500) were randomly divided into three treatment groups with six replicates consisting of six birds per replicates. Treatment 1 (control) was fed with available commercial starter and finisher diets containing dicalcium phosphate. Treatment 2 and Treatment 3 were fed with the same commercial diets but supplemented with 0.5% and 1.0% of monocalcium phosphate, respectively. Throughout the 42 days feeding trial, broilers from each treatment group were observed and recorded daily for any abnormal signs of leg disorders. Six broilers were randomly selected on day 21 and 42 from each treatment group where blood samples were collected via the brachial vein into anticoagulant (EDTA) and plain blood tubes for haematology and biochemistry analysis. Leg weakness, lameness, recumbency, and splay legs were the main findings observed in broiler demonstrating leg problems. The total broiler culled due to leg problem was relatively highest in T3 (4 broilers), followed by T1 (2 broilers), and T2 (none). There were significant differences ($P<0.05$) in the WBC, total protein, albumin, globulin, and alkaline phosphatase on day 21. Only WBC and alkaline phosphatase exhibited significant differences ($P<0.05$) between groups on day 42. Broilers supplemented with 0.5% MCP (T2) revealed the highest significant values as compared to the other treatment groups for both starter and finisher phases. There were no significant differences ($P>0.05$) in the other parameters. In summary, 0.5% monocalcium phosphate was recommended as supplementation through this study; as it improves the overall health performances of the commercial broiler chickens.

Prebiotic activity of glycan from edible bird's nest

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Abstract

Glycoproteins of edible bird's nest (EBN) from swiftlets (genus *Collocalia*) represent a natural source of glycan-rich material. The glycan consumed can be fermented by gut microbiota which encouraged and stabilized the growth of beneficial and probiotic bacteria. This study was carried out to determine the potential of EBN as a prebiotic material. The digestibility of EBN was evaluated using a simulation of in vitro mouth, gastric, and duodenal human model system. Further study on the potential prebiotic activity of EBN was carried out using simulated human colon model. The in vitro colon model fermentation was done by applying the substrate of EBN to a mixed bacterial population from human faecal samples. The bacterial growth profile was analysed using fluorescence in situ hybridization (FISH) technique. The results demonstrated that approximately 96% of the EBN protein and 36% of the EBN sugar were digested in the digestion process. The digested EBN compound may be absorbed and exert numerous positive effects on human health. The remaining undigested compound can be potentially delivered into colon and act as a potential prebiotic, a source of food for the colon microbiota. Results of in vitro gut fermentation showed that the growth of beneficial bacteria is significantly increased and successfully inhibit the growth of pathogenic group of bacteria. These findings showed that the gut microbiota was able to use the glycan source from EBN and the contribution of undigested peptide in EBN glycopeptide complex in the prebiotic activities to support the growth of beneficial bacteria. Therefore, EBN has the potential to exert prebiotic activities upon consumption and can be used as prebiotic ingredient in food products.

Effect of edible bird's nest (EBN) on quality of chilled Arabian stallion semen using EquiPlus® extender

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Abstract

The aim of the present study was to evaluate the effect of different concentrations of EBN added into EquiPlus® extender on the quality of chilled Arabian stallion spermatozoa for 48 h. Semen samples were collected from five stallions using artificial vagina. The collected semen samples were then divided into three equal parts and diluted using EquiPlus® extender containing 0% (control), 0.12% and 0.24% of EBN. After removing the seminal plasma via centrifuge, the samples were re-diluted for storage using the same extender with the different concentrations of EBN. Final diluted semen samples were equilibrated at 5 ºC in cold handling cabinet for 90 min and stored for 48 h before evaluation for total and progressive sperm motility using a computer assisted semen analyzer (CASA) and viability by Androvesion method. Results showed no interaction between EBN concentrations and time of storage ($P > 0.05$) on total motility (TM) and progressive motility (PM). In addition, although there was a relative improvement in magnitude for TM and PM for the 0.24% EBN supplement, the difference was insignificant (P> 0.05). In conclusion, no adverse effect with the addition of EBN into EquiPlus® extender on Arabian stallion semen was observed and the concentrations of EBN supplemented appeared to be not good enough to achieve a significant improvement after 48 h storage. Hence, future studies using higher concentrations of EBN are recommended.

Influence of different sources of oil on growth performance and meat quality in broilers

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Abstract

This study was conducted to determine the effect of dietary diet supplemented with different types of fats (crude palm oil (CPO), crude palm fruit oil (CPFO), refine, bleached and deodorized palm olein (RBD PO), refine, bleached and deodorized palm olein+2% Lecithin (RBD+2%Lcithin), and soybean oil (SO) on the growth performance, meat quality, and blood plasma lipid profile of broilers. A total of 210-day-old broiler chicks (cobb-500) randomly divided into five treatment groups with six replicates. Each replicate consisted of seven birds and randomly assigned to five diet containing different oil sources: T1, CPO (control); T2, SO; T3, CPFO; T4, RBD PO; T5, RBD PO+2%L for six weeks. Pen feed intake (FI) and individual body weight (BW) were recorded weekly. Six broiler chicks at day 21 and 12 broiler chickens at day 42 were randomly selected from each treatment and slaughtered for sampling. Blood samples were collected for measurement of serum lipid profile and the carcasses were dissected manually and the following parameters were recorded: carcass weight and dressing percentage (carcass weight as % of final BW), and weight of breast meat and leg (thigh + shank). Average daily gain (ADG) and feed conversion ratio (FCR) were calculated. Dietary oil had no significant ($p > .05$) influence on body weight, weight gain, feed intake (FI), feed conversion ratio (FRC) among treatment groups, also meat quality, carcass characteristics were similar across treatments. However, birds fed SO had lower blood plasma cholesterol, triglycerides, low density lipoprotein and very low-density lipoprotein than other oil groups.

Effect of sodium selenite, selenium yeast and *Stenotrophomonas maltophilia* enriched bacterial protein (ADS18) on laying performance in hens

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Abstract

This study compared the effects of *Stenotrophomonas maltophilia* as enriched bacterial protein (ADS18) with commercially known selenium yeast and sodium selenite on laying performance in hens from 22 to 40 weeks. One-hundred and forty four (144) Lohman brown hens with similar laying rate (86.81%) and body weight (1714 ± 185 g), were randomly distributed into 4 treatments for 17 weeks (from 126 d old to 280 d old) with 6 replicates of 6 hens per replicate feeding trial. The diets (corn soybean meal diet) constitute organic and inorganic forms of Selenium (Se) which were supplemented with 0 (control), 0.3 mg/kg Se from enriched bacterial protein (ADS18), 0.3 mg/kg Se from commercial selenium yeast, (SY) and 0.3 mg/kg sodium selenite, (Na_2SeO_3) (SS). Parameters like daily egg number and weight were recorded for each hen, feed intake and laying rate or egg production were recorded weekly. Egg mass was calculated by multiplying egg number by average egg weight. Feed conversion ratio was recorded as g feed consumption divided by g egg mass (g feed/g egg mass). Number of normal, soft shelled or cracked eggs, mortality and morbidity were properly recorded daily. Results showed that laying rate of the organic Se (ADS18 > SY) group increased significantly ($p < 0.05$) as compared to SS and Con groups. Similarly, significance difference ($p < 0.05$) was observed in daily egg mass (g/day), feed conversion ratio (g of feed/g of egg) and live body weight gain (LBWG) in Se-enriched. In conclusion, enriched Se-bacterial protein (ADS18) enhances laying performance as compared with other Se supplements. Moreover, ADS18 was utmost promising in most of the growth parameters and egg production, probably via influencing Met metabolism. Studies on egg quality traits, antioxidant capacity, and egg Se concentration/deposition (egg, tissue and serum) is underway.

Effects of *Lactobacillus plantarum* postbiotic metabolites on growth performance of broiler chickens

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Abstract

Modification on the feed nutrients especially feed additive is crucial to maintain a profitable industry as well as to counteract with heat stress, diseases and feed price fluctuation. Postbiotic, the metabolites derived from the metabolism of probiotic, is a potential supplement to improve the growth performance in broilers. This study was conducted to determine the growth performance of broiler chickens after supplemented with selected postbiotic. The Hydroxyl Radical Scavenging (HRS) activity, Reducing Power (RP) and lactic acid production were determined at wavelength 536nm, 700nm and 390nm respectively by using UV spectrophotometer. In addition, a feeding trial was conducted using 245 Cobb 500, male day-old-chicks. All the birds were weighed and assigned randomly into 5 treatments: (1) negative control (basal diet only), (2) positive control (basal diet+0.01% oxytetracycline), (3) basal diet+0.1% Postbiotic RG11, (4) basal diet+0.1% Postbiotic RI11 and (5) basal diet+0.1% Postbiotic RS5. The birds were fed with starter feed from day 0 to 21, followed with finisher feed until day 42. From the results, there was no significant difference ($P>0.05$) in HRS activity among all the postbiotics while postbiotic RI11 exhibited significantly highest ($P<0.05$) RP among all the postbiotics. Furthermore, postbiotic RS5 had the significantly highest ($P<0.05$) lactic acid production between all the postbiotics. Based on the results of growth performance, the final body weight and body weight gained of the birds supplemented with 0.1% postbiotic RS5 were significantly highest ($P<0.05$) as well as significantly lowest ($P<0.05$) in feed conversion ratio among all the dietary groups. There is also no significant difference ($P>0.05$) on the feed intake between all groups. In conclusion, feeding 0.1% of postbiotic RS5 can improve the growth performance of broiler chickens, most probably due to the production of lactic acid and antioxidant activity.

Effects of feeding paraprobiotic in mycotoxin contaminated diets on the intestinal morphology and immunoglobulin status of broiler chickens

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Abstract

A study was conducted to investigate the effects of feeding grains contaminated naturally with mycotoxins on the intestinal morphology and immunoglobulin status of broilers and to evaluate the efficacy of different strains of paraprobiotic feed additive with the ability to detoxify mycotoxins. A total of 384 one-day old male broiler chicks (Cobb 500) were randomly assigned to one of the eight dietary treatments for 42 days. The eight dietary treatments were: T1 with Basal diet without toxin binder, T2 with Basal diet + 1% toxin binder, T3 with Basal diet + 1% Paraprobiotic UL4, T4 with Basal diet + 1% Paraprobiotic TL1, T5 with Basal diet + 1% Paraprobiotic RG14, T6 with Basal diet + 1% Paraprobiotic RG11, T7 with Basal diet + 1% Paraprobiotic RI11and T8 with Basal diet + 1% Paraprobiotic RS5. All nutrients supplemented in the diets were formulated according to the recommended formulation. A slight improvement in the intestinal morphology over the experimental period was observed in broilers fed mycotoxin contaminated diets with supplementation of paraprobiotic as compared with control diet. Broilers fed with paraprobiotic groups increased ($P<0.05$) villi height and villi height: crypt depth ratio in the jejunum and ileum compared with the control group. However, villi height and villi height: crypt depth ratio in the ileum were not altered ($P>0.05$) in broilers fed with diet containing toxin binder compared with the paraprobiotic group. Plasma IgG and IgM concentration in broiler fed control group was lower ($P<0.05$) than those in toxin binder and paraprobiotic groups. In conclusion, feeding mycotoxins contaminated diet supplemented with paraprobiotic did not depress the intestinal morphology and helped to improve immune status of broilers. Furthermore, the results indicate that supplementation of paraprobiotic is beneficial in counteracting the toxicity of mycotoxins in broilers diets.

Effect of different levels of calcium and phosphorus on egg production of MARDI village chickens

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Abstract

A 5-week experiment was conducted to investigate the effects of feeding diets with different levels of calcium (Ca) and phosphorus (P) on percentage of hen-day egg production and egg weight of *Ayam Kampung* MARDI (AKM) or MARDI village chickens. The experiment was conducted using a Complete Randomized Design (CRD). A total of 81 female AKM aged 26 weeks were allocated to 3 treatments: 1) Low (3.32% Ca and 0.42% P), 2) Medium (4.00% Ca and 0.52% P) and 3) High (5.54% Ca and 0.72% P), each with 3 replicates. The experimental diets were isocaloric and isonitrogenous which contained 18% crude protein and 11 MJ/kg metabolizable energy with similar Ca:P 2:1 ratio. Daily egg production, egg weight and feed intake were recorded and hen-day egg production was calculated. Data were analysed using One-Way ANOVA. There was no significant difference among the treatment groups on egg weight, egg production and percentage of hen-day egg production. The results also suggest that AKM require lower Ca and P levels compared to commercial layers which require 4.10% Ca and 0.6% P. Thus, it is important to determine the requirement of Ca and P in AKM to avoid overfeeding, which could lead to higher feed cost. Nevertheless, egg quality needs to be determined when such low levels of Ca and P are used to ensure the egg quality is not compromised.

Effects of dietary calcium and phosphorus levels on growth performance in pullet and pre-layer phases of Ayam Kampung MARDI (AKM)

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Abstract

A study was conducted to determine the effect of different dietary calcium (Ca) and phosphorus (P) levels on the growth performance of Ayam Kampung MARDI (AKM) during pullet and pre-layer phases. It was hypothesized that the level of Ca and P affected the growth performance during those phases. Experiment 1 was conducted at 15 to 17 weeks of age of the pullets which were allocated to 3 dietary treatments: 1) low level of Ca and P (0.75% Ca and 0.48% P), 2) medium level of Ca and P (0.90% Ca and 0.58%P) and 3) high level of Ca and P (1.15% Ca and 0.24% P) whilst Experiment 2 was in pre-layer phase (week 18 – week 19), and the treatments were: 1) low level (1.69% Ca and 0.55% P), 2) medium level (2.00% Ca and 0.65% P) and 3) high level (2.31%Ca and 0.75% P). The experimental diets were formulated to contain 18% crude protein, 11 MJ/kg metabolisable energy and 2:1 Ca and P ratio. Both experiments were conducted in a Complete Randomized Design (CRD), with each group represented by 3 replicates consisting of 13 birds each. The birds were fed *ad libitum* and water was made available at all times. Live weight (LW) and feed intake (FI) were measured weekly and live weight gains (LWG) and feed conversion ratio (FCR) were calculated. Data were analyzed using One-Way ANOVA to assess the effects of different dietary Ca and P levels on growth performance during those phases. There was no significant difference in LW, LWG, FI and FCR among treatments. However, during pullet phase, level of Ca and P had the tendency to reduce LW and BWG. On the other hand, during pre-layer phase, level of Ca and P tended to increase BW and BWG. The results suggest that during pullet phase, female AKM would require lower Ca and P while higher Ca and P would be required during the pre-layer phase.

Improving reproduction performance in goats by laserpuncture oestrus induction: An alternative of non-hormonal treatment

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Abstract

Reproduction plays an important role in determining the efficiency of farming system in goat production. Anoestrus post-partum symptom is one of the biggest problem in the reproduction management in smallholder goat farmer in Indonesia. The suboptimal feeding management, housing and rearing cause negative effect on growth rate, reproductive hormone feedback-mechanism regulation, body condition score and return to oestrus post-partum. Low power-laser exposure to reproductive acupoints is capable to stimulate the neurotransmitter in delivering signal to hypothalamic-hypophysial axis and begin for secretion of main reproduction hormone. The end result of this cascade action is the oestrus exhibition. In our serial experiments using a simple self-assembling laser puncture equipment, the laser exposure on the 17 reproductive acupoints for 3 consecutive days for 10 sec of each resulted 50% to 100% oestrus of local goat with low body condition score reared at the Research Station of Faculty of Animal Science, Universitas Brawijaya, that was depending on the parity of does. However, the onset of oestrus from the treatment (2 – 13 days from the treatment time) and length of oestrus (42 – 84 hours) showed high variability. In small holder condition, the number of does showing oestrus and the pregnancy rate following laser induction (50%, 50%) was similar to those following PGF2α injection (80%, 70%, respectively), and the combination of laser and PGF2α treatment produced highest number of oestrus and pregnant does (100%, 80%, respectively). In conclusion, the low power laser exposure on the reproduction acupoints in does with anoestrus postpartum symptom induced and stimulated the action of hypothalamus and hypophysis for secretion of reproduction hormones resulting significant number of oestrus animal. The use of laserpunture for inducing oestrus resulted comparable number of oestrus and pregnant animals with PGF2α, and use the both methods showed the positive complementary effect for resulting oestrus and pregnant animal.

Re-strategizing local grain corn production in Malaysia

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Abstract

Malaysian livestock industry relies heavily on importation of local ingredients for animal feed. In 2018, Malaysia imports 3.7 million metrics tonnes of grain corn with the value of RM3billion. There is an urgent need to rejuvenate the local grain corn production for food security reasons. Several initiatives were taken to introduce grain corn production in Malaysia since 1980s, however, it was not sustainable due to high cost of production. Under the 'Sumber Kekayaan Baru' program, grain corn production became a national agenda in 2016 with concerted efforts by MOA, MARDI, DOA, LPP, IADA and DVS. The initial aim was to plant grain corn in rice field during rice off-planting seasons. Several different approaches were identified to improve the production system hence reducing the cost. Current Research and Development on grain corn production focuses on better hybrid varieties with higher yield, efficient agronomic practices including irrigation, soil suitability as well as pest and disease control, farm mechanization for planting, fertilization and harvesting, efficient post-harvest handling system, corn quality standards and assurance as well as economic and market analysis. Initial studies indicate that with new varieties, yield can be improved. As mechanization is necessary to make grain corn production more efficient, farms need to be of a larger scale and adapt to the requirements of machines used. Different drying systems were evaluated to identify the most efficient system to produce high quality grain, acceptable to the industry with acceptable price. To ensure the sustainability of the industry, several market and acceptance studies are being conducted to better understand the needs of both grain corn farmers as well as feed millers which are the targeted buyers of the local grain produced.

Livestock GHG emission in Malaysia: past and future

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Abstract

Greenhouse gas emissions remains a global issue since decades. Malaysia's greenhouse gas emissions from the agricultural sector in 2016 was equivalent to 10372.9 GG CO_2 eq an increase by 8% compared to that in 2005 and 60% compared to 1990. The livestock industry sub-sector contributed to almost 20% of the country's agricultural GHG emissions equivalent to 1998 Gg CO_2 eq. This value will increase to more than 28% if the country is able to increase the agricultural production to achieve SSL targets. The livestock industry contributes to GHG through the release of methane by ruminant's enteric fermentation and from manure management. Methane and nitrous oxide are 25 and 298 times of the potential of global warming (GWP). The livestock industry, especially ruminants, is expected to continue to grow between 10-15%. Reducing gas emissions from the livestock industry sub-sector is more challenging as the population is projected to increase to over 40 million by 2040. Furthermore, the challenge of rising global temperatures and increasing rainfall will have a direct impact on the agriculture and farming industry itself. Various mitigation and adaptation measures can be refined in line with country's efforts in reducing GHG emissions by 45% by year 2040.

The potential of Belgian Blue crossbreds in the Malaysian beef cattle industry

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Abstract

The beef cattle crossbreeding program had started when the Department of Veterinary Services (DVS) permitted the importation of temperate breeds to enhance the genetic of the indigenous. However, the offspring produced often have variable growth and muscling characteristics in the tropics. In line with the national aim of increasing self-sufficiency of beef from 24% to 40%, DVS has endeavoured to improve the local animals by inseminating them with genetic materials from European cattle that has excellent muscling traits. The objective of the study is to assess the potential of Belgian blue (BB) crossbred following the introduction of its genetic materials. In 2016, DVS had imported 10,000 straws of BB frozen semen which were inseminated to the selected local female cattle. The BB breed was selected because of its double muscling trait hence it will produce offspring with higher meat percentage. Out of 4,886 female cattle inseminated, 2,985 had conceived (61.09%), and 2,555 calves were born (52.29%). A total of 104 selected farmers involved in the program were given with a set of questionnaire, focusing on operational management and opinion on BB potential. 87.5% of them agree BB crossbred can be one of the national crossbred options. Whilst 93.27% of them agree BB crossbred farming generates more income than the local breed. Based on the current results, the introduction of BB is accepted by the local farmers, albeit at a different magnitude. These are hints of the potential adaptability of the BB sired population to the local animal husbandry practices in Malaysia.

Production of β-mannanase by *Bacillus subtilis* ATCC 11774 using PKC as a sole carbon source: Medium screening

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Abstract

Malaysia is the world's second-largest producer of palm oil after Indonesia. One of the by-products obtained from the oil palm industry is palm kernel cake (PKC). PKC is widely utilized either as an ingredient in animal feed compound or directly as animal feed mainly for ruminants. However, the usage of PKC as a feed ingredient in monogastric animals such as broiler is rather limited due to its low protein digestibility, high fibre content and gritty nature. PKC can be used as an inducer in β-mannanase production since it contains a large amount of mannan. This study was performed to screen the important medium components (PKC, yeast extract, peptone, sodium chloride and magnesium chloride), process temperature and initial pH the production of β-mannanase by *Bacillus subtilis* ATCC 11774. Plackett-Burman experimental design was used to screen the variables and twelve experimental runs were suggested. The findings show that the highest enzyme activity of 246.0 U/mL was detected at higher concentration of PKC (10 g/L), yeast extract (10 g/L) and sodium chloride (10 g/L), and at lower peptone concentration (10 g/L) when initial pH and temperature were set at 6 and 25^{o}C, respectively. In contrast, the lowest β-mannanase activity of 35.07 U/mL was observed when the concentrations of PKC, yeast extract, peptone, sodium chloride and magnesium chloride were at 1 g/L, 1 g/L, 10 g/L, 10 g/L and 0.5 g/L, respectively and at initial pH of 8 and 25^{o}C of incubationn temperature. In compariosn, 10 g/L of PKC resulted in higher activity of β-mannanase than 1 g/L of PKC. In conclusion, PKC has a great potential to be used as a carbon source for β-mannanase production by *B. subtilis* ATCC 11774, which can be utilized in broiler feed formulation to improve mannan digestibility of PKC.

The utilization of rice straw as animal feed in Kedah-Perlis

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Abstract

Kedah and Perlis are major rice producing states in Malaysia, thereby large quantities of rice straw are produced as by-products. Rice straw has a great potential as to be used animal feed, especially as source of fiber. The availability of rice straw and the amount of the rice straw available to be used for ruminants make it a choice feed source among livestock farmers. Rice straw is mainly used as ruminant feed in maintenance ration especially during the dry season when pasture and green feed are not available. Various types of treatments to improve the nutritional value of rice straw has been applied including physical, biological and chemical methods. It is also frequently given untreated. However, due to poor collection and storage of straw during harvesting by rice farmers, the great potential of these by-products as cheap animals feed resources for ruminants is not realized.

A preliminary study on the protein content of locally grown grain corn during storage

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Abstract

In Malaysia, grain corn is widely used as the main energy source in animal feed formulation particularly in poultry. The grain corn must be free from fungi, mycotoxins, toxic seeds and pesticide residues that can affect the health and productivity of the animals. Therefore, the moisture content of grain corn should be between 24 to 32% at harvest and 12 to 14% during storage. The temperature and relative humidity are the main factors to be controlled for the storage of grain corn. In order to maintain the nutritional quality of corn, it is recommended to store grain corn under high temperature with low relative humidity (30ºC, 40% RH) for more than six months, while storage in low temperature and high relative humidity (10ºC, 90% RH) is not recommended for storing exceeding three months. The aim of this study was to evaluate the quality of grain corn in terms of protein content during storage at 24ºC and 80% relative humidity for 6 months. The grain corn was packed in several bags. The content of the bags was sampled every month and analysed for crude protein using Buchi protein analyser system. The results showed that there was a decline of 30% in protein content from 9.73 to 6.86% within six months. However, there was high variability in the protein contents among the samples possibly due to insect infestation that was observed on the endosperm of grain corn.

The effect of energy manipulation on Brakmas female cattle bodyweight gain during flushing under breedlot system

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Abstract

Breedlot system, is an alternative production system for livestock particularly ruminants. The purpose of breedlot system is to cater problems related to animal production such as lack of land available for livestock production, animal welfare and animal genetic preservation. The objective of the study was to evaluate the effect of energy level during flushing on performance of Brakmas cows under breedlot system. Eighty heads of Brakmas mature cows were selected for breeding. Prior to breeding, all animals undergo flushing for 30 days. Female cattle were divided into eight group pens, receiving two different flushing feed, comprises of 60% (w/w) concentrates; and 40% (w/w) fresh cut Napier Pak Chong grass. Four group pens received flushing feed which meet energy requirement, while the other four group pens received flushing feed which was 20% higher in energy than requirement. The bodyweights of each cow were recorded before and after 30 days flushing period. Results showed that different energy level during flusing did not affect animal bodyweight; and bodyweight gain. Nevertheless, there was a tendancy towards increasing bodyweight gains with higher energy supplied in the diet. Raising cows under breedlot system may leads to better animal growth and weight b gains as most of its energy and nutrient are use towards body and muscle build up.

Feed efficiency and performance of red hybrid tilapia juvenile feeding on feed formulated with local sources of energy and protein

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Abstract

Twelve weeks of feeding trial was conducted using red hybrid tilapia juvenile (initial body weight of 44±1g) fed with three different treatments: control (commercial feed), diet formula A and diet formula B. The objective of the trial is to observe the growth performance of the fish when fed with diets comprised mainly non-conventional feedstuffs, locally produced in Malaysia. The treatment diets used were formulated to be isocaloric and isonitorgenous following the requirement recommended for tilapia using local protein and energy sources, with diet formula B does not contain fishmeal at all. 750 fishes were randomly assigned to five replicates per treatment (with each replicate containing 50 fishes) and reared in a 1000 litre circular polytank with continuous aeration in an open space. Water parameters were constantly measured and monitored biweekly to ensure it is within the range of culture condition for freshwater fishes. Feeding was given at 6% of body weight during the initial stage of the trial and was further reduced to 2% as the fish grow. Growth data were measured every fortnight by weighing the fish and feed portion were adjusted accordingly. Fish fed with diet formula A and B showed significant difference ($p<0.05$) when compared to the control diet for weight gain, specific growth rate (SGR) and feed efficiency ratio (FER). Among the two test diets tested, fish in formula B performed slightly better than fish fed with formula A, however, it is not significantly different ($p>0.05$). Fish feeding on commercial feed showed the best performance with highest weight gain achieved (194.38±19.32), specific growth rate (2.00±0.07) and feed efficiency ratio (0.90±0.02).

Helminth infection in Katjang hybrid goat raised under semi intensive system

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Abstract

Helminthiasis is one of the most common problem in small ruminant industry characterized by decreased liveweight, loss of appetite, diarrhoea and high mortality rate. Katjang Hybrid goat is a new crossbred created by MARDI. Since it is a new breed, there are no available information regarding its resistance towards helminth infection. Objectives of this study were to evaluate the resistant level of helminthiasis infection in Katjang Hybrid goats raised under semi intensive system. Two different grazing times were used in this study to investigate helminth infection rates via times. 20 Katjang Hybrid males and females each were used in this experiment. All animal were raised under semi intensive system. Both male and female animals were divided equally to two groups. First group with 10 males and females were released for grazing from 8 am - 11 am (T1) daily while the second group were released at 9 am - 12 pm (T2). All experimental animals were treated with anthelmintic drug prior to of the study. The study were carried out for 120 days.Faeces were collected every 30 days for faecal egg count to determine the level of helminth infection. Results indicated that male (680±168.65 egg/gram) and female (710±119.72 egg/gram) groups of Katjang Hybrid grazing at T1 times have higher infection rates ($p<0.05$) compared to T2 Katjang Hybrid group (m= 490±172.88 egg/gram, f=520±113.53 egg/gram) after 120 days of observation. Helminth infection in all Katjang Hybrid goat groups were at low level after 120 days, indicating the helminth resistant potential of this breed.

Growth performance and body composition of river catfish (*Pangasius hypophthalmus*) fingerling fed with palm kernel meal

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Abstract

This study was conducted to determine the effect of palm kernel meal inclusion on feed intake, growth performance and body composition of *Pangasius hypophthalmus* reared in polyethene tanks. The study used 450 fish fingerlings, then assigned into the tanks in completely randomized design with five replications. The fish fed with isocaloric and isonitrogenous formulated diets containing 0% (control), 10% and 15% of palm kernel meal for 84 days. At the end of study, the final body weight was measured and the carcass from fish fillet taken for proximate analysis. The initial weight of fish in control, 10% PKM and 15% PKM treatment groups were 11.28±0.16, 11.37±0.26 and 11.37±0.15 g respectively (P>0.05). The fish fed with 10% PKM was superior in weight gain (P>0.05) as compared to the fish fed with 0% and 15% PKM. The highest specific growth rate (SGR) also obtained from fish fed with 10% of PKM (0.87±0.07%). There was no significant different observed for the feed intake and growth performance of the fish (P>0.05). The protein content from the carcass analysis was slightly reduced with increasing level of PKM (P<0.05). The level of protein in control, 10% PKM and 15% PKM treatment groups were 14.92±0.44, 14.50±0.31 and 14.18±0.52%, respectively. As for the moisture, ash and lipid content of the fish fillet were unaffected by the treatment groups (P>0.05). Overall, these findings indicated that the dietary inclusion of palm kernel meal can be included for the river catfish, *P. hypophthalmus* fingerling up to 10%.

Effect of rice polish inclusion in *Pangasius hypophthalmus* formulated diet

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Abstract

Pangasius hypophthalmus is currently among high demanded fish in Malaysia and worldwide. It is one of the species cultured in cages especially in the East Coast of Malaysia. A study was conducted at MARDI to investigate the effect of rice polish (RP) inclusion on the growth performance of *P. hypophthalmus* fingerling. The fish used for this feeding trial were bought from commercial farm and acclimatized for a few weeks. The fish then divided randomly into three treatment groups (0%, 10% and 15% RP) with 30 fishes per tank in five replications. The diets formulated for all treatment groups were isocaloric and isonitrogenous. The initial body weight for 0%, 10% and 15% RP treatments were 13.90±0.65, 14.18±1.17 and 13.46±0.73g, respectively. The fish were fed with the treatment diets until satiation level, twice a day for 12 weeks. The higher weight gain was observed in control group (13.11±2.30g) follows by 10% RP (10.37±1.86g) and 15% RP (9.93±1.60g). The feed intake for 0%, 10% and 15% of RP groups were 16.53±1.79, 15.21±1.11 and 14.60±1.27, respectively. Based on the results, reducing pattern of weight gain and feed intake were observed with the increment inclusion of rice polish. While the FCR value was increased with the increasing level of inclusion (0% RP: 1.27±0.16, 10% RP: 1.49±0.19 and 15% RP: 1.48±0.12). However, the results of weight gain, feed intake and feed conversation ratio (FCR) were not significantly different ($p>0.05$) among treatment groups. Therefore, the present study suggested the rice polish for *P. hypophthalmus* can be included in fish diet up to 15%.

Market of local fresh beef compared to imported buffalo meat in traditional market

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Abstract

Beef is the third most consumed meat in Malaysia with per capita consumption of 6.5 kg in 2017. Currently, domestic supply of beef is largely dependent on imported buffalo meat from India and makes it a major competitor to local fresh beef. Price is a factor often associated with competition between local fresh beef and imported buffalo meat as consumer demand more for quantity than quality. Thus, this study aimed to look into market structure of local fresh beef compared to imported buffalo meat from India with a focus on sales in the traditional market. A total of 73 butchers from various states of Peninsular Malaysia were interviewed during a survey using a structured questionnaire. The results showed that the majority of butchers (51.5%) only sold local fresh beef, followed by those who sold local fresh beef and imported buffalo meat at 38.2%, while those who sold only imported buffalo meat made up 10.3%. In terms of product differentiation, 84.6% of the butchers sold both types of meat labelled their products while the remaining 15.4% did not. Public consumer was the major (97.3%) buyer in this market compared to restaurant/F&B outlet owner (60.3%), retailer (37%) and food manufacturer (12.3%) as most of their sources were directly from the supplier or distributor. This study also showed that the demand for local fresh beef was higher (58.9%) than imported buffalo meat (15.1%), while 26% of the butchers said that the demand between local fresh beef and imported buffalo meat was the same.

Dairy buffalo farming scenario in Kedah

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Abstract

The objective of this poster is to draw an overview on present scenario of dairy buffalo practice in Kedah and the contribution to the farmer's income. Among Malay farmers in Kedah, they have been known occasionally milk their indigenous swamp buffalo (*kerbau sawah*) for their own consumption. In 2011, Department of Veterinary Services (DVS) brought new genetic materials of dairy buffalo from India and Pakistan namely Murrah and Nilli Ravi for Farmers Transformation Program (TRUST scheme). The distribution of dairy buffalo involving the registered farmers at Langkawi, Jitra, Kota Setar, Kulim, Pendang and Baling with intensive and semi-intensive rearing system. The value-added products of buffalo milk including cheese, ice-cream and curd (*dadih)*, which has high market value. The high demand of these products is the key factor to encourage farmers increased their farm productivity and better income.

Milk production performance of Jersey-Friesian at early lactation in Keningau, Sabah

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Abstract

Local fresh milk production in Malaysia, has been steadily increasing and currently at 50% self-sufficiency (DVS, 2019). The government is conducting programs in place towards self-sufficiency in milk production. Milk production is generally influenced by breed, feed, environment and management system. If the breed has been determined, animal selection criteria for breeding is based on individual animal data, which is generally lacking under smallholder conditions. The aim of this study was to show variations in early lactation milk production of Jersey Friesian cows at a smallholder farm in Keningau, Sabah. A total of 5 Jersey Friesian cows were used to collect data on their milk production performance at early lactation stage (day 14 to 100). Animals were fed standard commercial feed at 3.5% of their mean body weight and fresh cut of grass were given *ad libitum*, while milk production recorded daily. Although of similar breeds, there were distinct differences in daily milk yield ranging from 4.0 – 12.5 L/day. A similar distinct difference is also observed in cumulative milk. However, for breeding selection, the farmer should be advised to select only animals with the lowest coefficient of variation to ensure production consistency. In conclusion, this paper demonstrates the importance of individual cow data analysis for the success of any dairy farm, especially under smallholder systems where data is scarce.

Effect of dairy cattle breed on milk composition in the same management conditions of smallholder farm in Malaysia

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Abstract

The objective of this study is to evaluate the effect of dairy cow breed on milk composition under the same environmental conditions. Sixteen dairy Holstein-Fresian cross and Mafriwal cross cattle breeds were used in this study. Eight cows in mid to late lactation stages were selected from each breed and monitored for ninety days. Animals were maintained under semi intensive systems and consumed similar diet. A total of 100 ml milk samples was collected three times every 30 days from each milking cow. The analysis was conducted for each breed in duplicates using a Milkotester Master ECO to determine fat, SNF, density, protein, lactose and salts. The factorbreed had a significant effect on fat ($p<0.0052$), density ($p<0.0087$), and protein ($p< 0.0283$). Lactose, SNF and salts parameters were not significant between the breeds with p value 0.055, 0.064 and 0.054 respectively. Results from thisis study suggests that crossbreeding Holstein-Fresian cross and Mafriwal cross cows at different blood levels had a significant effect on the milk content except for lactose, SNF and salts. The fat content of Holstein-Fresian cows was higher compared to Mafriwal cows while milk protein, density, lactose, salts and SNF of Mafriwal cross cows were higher than Holstein Fresian cross cows breed. The variation of milk composition between breeds depends on the breed, nutritional quality and physicochemical characteristics. However, other factors such as farm hygiene, animal husbandry practices and milk processing may affect its quality.

Carcass analysis of goats fed with oil palm by-products: A preliminary study

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Abstract

An experiment was conducted to examine the effects of feeding oil palm by-products based pellet in comparison with commercial pellet on the carcass quality of Boer and Katjang goats. A total of four Boer and four Katjang goats were randomly allocated to four groups of two goats per breed and kept in individual pens. The experimental design used was 2 × 2 factorial, with the treatment diet and breed as the main effects. Each group received either commercial pellet (COM) or oil palm by-products based pellet (OPB) which was formulated using oil palm frond (OPF), palm kernel meal (PKM), empty fruit bunch (EFB), palm fatty acid distillate (PFAD), corn, soybean meal, rice bran and other feed additives. The goats were fed at 4% of body weight with the respective diets, based on 60% pellet and 40% Napier grass, once daily at 9.00 a.m. At the end of the feeding trial, the goats were fasted for 24 hours with free access to water before slaughtering and subjected to carcass analysis. Treatment diets did not have any significant differences ($P>0.05$) on carcass quality. Similar dressed percentages were observed among treatments and were within acceptable dressed percentages which are between 40-50 %. However, Boer and Katjang goats fed with OPB showed higher meat and lower fat percentage with 66.34 and 9.50%, respectively, when compared to goats in COM group with 62.49 and 11.02%, respectively. Boer breed had significantly higher ($P<0.05$) live body weight, dressed weight and chilled carcass weight when compared to Katjang goats. Nevertheless, bone, meat and fat percentage were not differ significantly ($P>0.05$) between Boer and Katjang goats. Results from this study suggested that it is possible to replace goat commercial pellet with oil palm by-products based pellet without compromising the carcass quality.

Preliminary study on design of small-scale biogas plants in dairy farms in Sabah, Malaysia

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Abstract

In 2009, the Department of Veterinary Services Sabah (DVS Sabah) built a prototype of biogas plant as part of the initiative towards alternative power resource and better animal waste management programme. Due to its success, DVS Sabah distributed 9 small-scale low-cost biogas digesters to selected dairy farms around Keningau, Sabah in 2011. The purposes of this biogas project were for livestock waste treatment, water heater and gas generation. In 2018, Research & Innovation Division revisited all the biogas plants to know their current status and it observed that only one biogas plant is still functioning to meet its purposes. Therefore this is a preliminary study on the design of those small-scale biogas plants to plan for future improvement. The biogas plant that is still working located in Stesen Pengurusan Ternakan (SPT) Sebrang which is the prototype biogas plant. The biogas plant is an underground oval concrete dome sized 12ft x 6ft and capacity is 32m³. It cost RM45,000.00. Throughout 8 years since it started produced biogas, this plant has only been serviced (desludging) 2 times. Meanwhile,the distributed biogas digesters made by Polyethylene. The design for this Polyethylene digester is a one-piece closed barrel and needs to be buried underground. The first batch of the digesters cost RM4500.00 each. They had a small capacity (4m³) and a thin layer of the body. There were cases where the digesters broke due to pressure from the tractor on the farm. Therefore, for the second batch of Polyethylene digesters, DVS Sabah had upgraded the capacity to 6m³ and sturdier body. The second batch digesters cost RM6000.00 each. The issue with Polyethylene digester's design is there is no service hole or stirrer stick to desludge the harden sludge inside. Once the sludge inside the digester started to harden, it blocked the inlet and outlet pipe.

Overview of a present scenario of biogas technology in Malaysia

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Abstract

Currently, there are 15 biogas plants using livestock waste that have been developed in Malaysia. The objective of this study was to observe the current development of biogas plants from livestock waste throughout Malaysia. The primary data was acquired through a survey method in which structural questionnaire forms were distributed to fourteen related respondents. Out of 15 biogas plants, 7 plants were built on cattle farms, 4 plants on pig farms, 3 plants on poultry farms and only 1 plant on buffalo farm. The study also revealed that only 40% of the biogas plants are still functioning, while 60% were dormant or nonfunctional attributed to many factors such as poor maintenance, construction, and design errors, weak technical support and lack of technical knowledge to run the system consistently, improper planning and monitoring as well as insufficient livestock waste to continuously producing biogas. The capacity of biogas plants can be divided into three categories which are small-scale (<1,000m3), medium-scale (1,000-10,000m3) and large-scale (>10,000m3). Based on that, 56% were small-scale biogas plants whilst 11% and 33% were medium-scale and large-scale biogas plants respectively. The total construction cost for each biogas plant in Malaysia is between RM4500 to RM30million, depending on the design, material, and capacity of the bio-digester. The adoption of biogas technology, however, has remained extremely low and the government involvement is important as support networks, especially in providing incentive to all farmers such as proposing the distribution of subsidy to all farmers that build a biogas plant in the future, hence helping to preserve and save the environment.

Physicochemical and nutritional composition of sea cucumber internal organ (SCiO) hydrolysate

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Abstract

Cucumaria frondosa, also known as orange-footed sea cucumber, belonged to the class of Holothuroidea, which is rich in bioactive compounds, including saponin, phenolics, condroitin sulphate, collagen, amino acid, vitamins and minerals. These bioactive compounds exhibit numerous medicinal benefits and health functions, making the sea cucumber one of the important components in marine ecosystem. During the processing of sea cucumbers, about 35-40% of the original raw material is visceral parts and water soluble components, which are treated as wastes, and discarded by the industry. Improper disposal of these waste materials contribute to environmental pollution. Proximate analysis showed that sea cucumber internal organ (SCiO) consists of 81.5% moisture followed by protein (9.3%), fat (4.1%), ash (2.8%) and carbohydrate (2.3%) with no cholesterol detected. Dried SCiO showed high crude protein (50.27%) and fat (22.16%) contents compared to other seafood products. The major amino acids in SCiO were glutamic acid, arginine and aspartic acid and it is also a good source of essential amino acid (EAA) with the presence of considerable amount of threonine, tyrosine and phenyalanine. For fatty acid composition, 27.60% of total oil content was the Omega-3 eicosapentaenoic acid (EPA) which has been associated with aid in foetus development, cardiovascular function, and Alzheimer's disease. Upon enzymatic hydrolysis using enzymes mixtures, solubility of SCiO increased from 43% to 66%. Both raw SCiO and SCiO hydrolysate also showed high DPPH radical scavenging activity which ranging from 57.1- 63.5% at 1 mg/ml. Utilisation of sea cucumber by-product is beneficial not only to the environment but also can be profitable to the industry as it can be applied as a food ingredient, animal nutrition, nutraceutical or in cosmetic product.

Milk yield of Thai-Friesian dairy cattle fed total mixed ration (TMR) formulated with local by-products

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Abstract

The objective of this study was to evaluate the milk yield of Thai-Friesian dairy cattle fed TMR formulated with local by-products which is palm kernel cake, copra meal and rice bran. A total of 18 Thai-Friesian cows from middle to late lactation were randomly allocated into three groups (A, B, C). Animals in Treatment A were fed with a combination of commercial pellet and formulated TMR, animals in Treatment B were fed only with formulated TMR while, those in Treatment C acted as control which being fed only with the commercial pellet. The TMR was calculated with a ratio of fresh Purple Guinea to TMR at 60:40 and feed was offered at 3.5% of body weight as dry matter basis. Nutrient composition of the feeds for dry matter, gross energy, crude protein and crude fiber for treatment A, B and C were 88.6%, 88.9% and 91.4%; 16.4 MJ/Kg, 16.5 MJ/kg and 15.2 MJ/kg; 16.1%, 15.5% and 16.3%; and 27.8%, 24.7% and 20.6% respectively. The respective feeds were offered twice daily after milking (0700 and 1900 hrs). Milk yield was recorded daily for 2 months. The result showed that cows in treatment A have significantly ($P<0.05$) higher milk yield compared to treatment B and C with values of 6.22 L ± 0.08, 5.15 L ± 0.10 and 5.30 L ± 0.06 respectively. However, the milk yield of Thai-Friesian breed in this study was lower compared to reported milk yield for this breed, at about 10 - 11kg/day in the mid-lactation stage. Other factors such as management and environment could have influenced the milk production in this farm. The use of local by-products as dairy TMR can be utilised but it requires further studies for its efficiency.

Effects of dietary inclusion of less shell, extruded and enzymatically treated palm kernel cake on growth-related genes expression in broiler chickens

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Abstract

Palm kernel cake (PKC) is a by-product of palm kernel oil extraction and could be used as a cost-effective feed ingredient for poultry. In this study, the effects of various post treated PKC on expression of growth-related genes were evaluated. A total of 2500-day-old male broiler chicks were randomly assigned to the following five isocaloric and isonitrogenous dietary treatments: 0% PKC (control: corn-soybean meal), 25% PKC in the forms of either untreated or less-shell or extruded or enzymatically-treated. Each treatment group consisted of five replicates with 100 chicks each. The expression of 27 selected genes related to growth and metabolism pathways were studied using PCR array. The results of this study showed that the expression of genes involved in mTOR (*GRB2*, *GRB10*), FoxO (*FOXO3*) and insulin (*PRKCZ*) signaling pathways, glycolysis/gluconeogenesis (*ENO1*), fructose and mannose metabolism and apoptosis (*RHOBTB2*, *LOC101750363*) were significantly ($P < 0.05$) up-regulated in broilers fed with less-shell PKC diet when compared to other treatments. The up-regulation of *LOC101750363* and *RHOBTB2* which involved in apoptosis pathways in less-shell PKC fed-chickens could influence the growth responses in broiler chickens. In conclusion, a more systematic analysis to evaluation of nutritional strategies of feed via assessing the gene responses would allow a rapid understanding of the nutrigenomic aspect.

Molecular studies of infectious bronchitis virus (IBV) from chicken and non-chicken samples in RVLBT using RT-PCR and nested PCR

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Abstract

This paper reports the molecular studies of the coronavirus infectious bronchitis virus (IBV) from chicken and non-chicken samples submitted to Regional Veterinary Laboratory at Bukit Tengah (RVLBT) by reverse transcriptase-polymerase chain reaction (RT-PCR) using universal oligonucleotide pair UTR1 & UTR2, corresponding to sequences within the 3´ untranslated region (UTR) of the genome and oligonucleotides specific for sequences within the S1 region of the spike (S) gene. Oligonucleotide pair UTR3 & UTR4 was internal to oligonucleotides UTR1 & UTR2 and was used in a nested-set arrangement to strengthens the identity of sequences. Based on the results, the non-chicken samples were tested positive coronavirus using oligonucleotides pair UTR3 & UTR4 but tested negative IBV using oligonucleotide pair S1. Captivatingly, 40% of the chicken samples were tested negative coronavirus with oligonucleotides pair UTR1 & UTR2 but then 100% of the chicken samples were tested positive coronavirus with oligonucleotides pair UTR3 & UTR4. Overall, the both universal and specific oligonucleotides were used for coronavirus IBV detection in avian samples, as well as it showed significances in terms of specificity and sensitivity. Nevertheless, the laboratory methods of detection for IBV in avian diagnostic cases was still technically insufficient in Malaysia, thus continuous study for the laboratory diagnostic methods especially on confirmative study on molecular characterization by sequencing and phylogenetic tree to obtain the origin of the IBV are essential.

Growth performances of Cobb500 broiler fed with dietary containing palm oil sources

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Abstract

The aim of the study was to evaluate the performances of Cobb500 broiler fed with dietary containing palm oil sources. A total of 240 day-old-chicks were randomly distributed into 4 treatments with 4 replications and 15 birds per treatment. The treatments were; T1: corn-soy-based ration as control (CNT), T2: diet with the addition of crude palm oil (CPO), T3 and T4: diets with the addition of different commercial palm fatty acid distillates (PFAD 1 and PFAD 2), respectively. Number of mortality and amount of feed intake were recorded daily while weight gain was recorded on weekly intervals. Feed conversion ratio (FCR) was calculated from the feed intake and weight gain. Broiler Performance Index (BPI) was determined from the final live weight and liveability divided by the FCR and days of rearing. There were no significant differences ($P>0.05$) in feed intake and weight gain during the starter period (day 0-18) between all treatment groups. Broiler fed PFAD 1 gave the best FCR on day 18 with 1.32. During the grower period (day 19-40), broiler fed CPO showed significantly higher ($P<0.05$) than PFAD 2 group in both feed intake and weight gain with 3.94 and 2.57 kg, respectively. In addition, the feed intake and weight gain from CPO group also translated into the best FCR of 1.53 which was significantly different ($P<0.05$) to all treatment groups, except with PFAD 1 group. Only 1 bird per group died was recorded throughout the experiment and contributed high BPI ranging from 362.67 to 412.92, indicating better overall broiler performance. In conclusion, the addition of palm oil sources (CPO and PFAD) can be one of the options to be considered by the feed industry as an alternative to energy source in feed formulation of broiler ration, without causing any adverse effect on the broiler performance.

Promoting locally available feed ingredients in animal diets with application of near infrared spectroscopy

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Abstract

Malaysia relies heavily on imported feed ingredients such as corn, soybean meal and fishmeal in the manufacturing of poultry and non-ruminant feeds. The potential of locally available feed ingredients needs to be explored to produce sustainable and cost-effective diets for the livestock industry. The nutrient composition of five local feed ingredients, namely palm kernel meal (PKM), plant meal, insect meal, sesame meal and copra cake were analysed and near infrared spectroscopy (NIRS) calibration curves of the ingredients were developed. Forty samples of each ingredient were analysed for protein composition using AOAC methods and the data were entered into the NIRS system to develop calibration curves. The ingredients had protein content ranging from 18 to 55%. NIRS calibration curves of protein levels for the five ingredients were established. All calibration curves had coefficient of determination (R^2) above 0.90 and standard error of cross validation below 0.100. NIRS acts as a rapid detection and quality monitoring system to measure constituents of nutrients of raw materials. As the quality of ingredients varies due to the growing conditions and from factory to factory, there is thus a need to monitor the nutrient quality of the ingredients. The nutrient content of raw ingredients will influence the nutrient component of the end products, i.e., the complete feed and feed formulation by the feed millers. The feed produced should meet the nutritional requirements of a specific set of livestock. The feed industry thus requires a system to rapidly screen ingredients to facilitate decision making. NIRS provides an alternative rapid and non-destructive technology for measuring nutrient constituents of raw materials. The major NIRS calibration curves used by feed millers in Malaysia are generally based on imported feed ingredients such as corn and soybean meal. NIRS calibration curves based on local feed ingredients can thus encourage the inclusion of local feed ingredients to create sustainable and cost-effective animal diets.

The effect of bromelain marination on meat quality of broiler chicken and duck

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Abstract

The objective of the study was to investigate the effect of bromelain marination on meat shear force, cooking loss, drip loss and colour of broiler chicken and duck. Two marination solutions were used. The crude bromelain extract was prepared by blending pineapple peel with distilled water at 1:1 ratio whereas 1.5 g of commercial bromelain (600 GDU) was homogenised with 1.5 litre of distilled water. A total of 200 g of breast meat was immersed in either 200 ml of crude bromelain, commercial bromelain or distilled water (control solution) for one hour at room temperature. The treatment groups consisted of T1) chicken meat + distilled water; T2) chicken meat + crude bromelain; T3) chicken meat + commercial bromelain; T4) duck meat + distilled water; T5) duck meat + crude bromelain; and T6) duck meat + commercial bromelain. After marination, drip loss, colour, cooking loss and shear force were analysed. All data were analysed by two-way ANOVA based on a completely randomized factorial design using SAS. Chicken meat marinated in commercial bromelain had the lowest shear force ($P<0.05$). Commercial bromelain reduced the shear force for duck meat to a value similar to chicken meat marinated in the control solution. However, crude bromelain extract failed to improve shear force for both chicken and duck meat compared to the control. Although bromelain was reported to be present in pineapple peel extract, its concentration was probably not sufficient to cause proteolysis of muscle protein. Chicken marinated in either crude bromelain or commercial bromelain showed the highest colour L ($P<0.05$). Duck marinated in commercial bromelain showed the highest colour a* ($P<0.05$). Drip loss, cooking loss and colour b* were not affected by the marination solutions ($P>0.05$, respectively). In conclusion, commercial bromelain increased meat tenderness and enhanced the red appearance of duck meat.

Effect of sesame meal inclusion on growth performance of *Pangasius hypophthalamus*

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Abstract

Sesame meal is a by-product from sesame oil production. It has potential to be used in aquaculture feed formulation as it provides protein and energy. The objective of this research was to determine the effect of sesame meal (SM) on growth performance, feed intake and survival rate of river catfish, *Pangasius hypophthalmus*. After acclimatization, the fish were assigned into the tanks in completely randomized design. There were 30 fishes in each tank with 4 replications and each tank was randomly assigned to one of the three different diets which were 0% SM that served as a control, 20% SM and 25% SM. The initial weights of the fish were recorded. The fish was fed twice a day until satiation level. Every fortnight, the fish were weighed to determine their body weight gain and the feeding rate was adjusted. Water exchange and water quality monitoring were conducted frequently to ensure the water quality at optimal level. At the end of 8 weeks, the fish was weighed and final readings were taken. From the results, there were no significant different ($p>0.05$) of the final body weight, feed intake and survival rate of fish among the treatment groups. However, there were significant differences ($p<0.05$) in weight gain, feed conversion ratio and specific growth rate (SGR) among the treatment groups. The fish fed with 25% SW showed the lowest SGR (0.43±0.03 g/day) and weight gain (40.09±2.94 g). The growth performance of river catfish, *P. hypophthalmus* at 20% inclusion of SM was comparable to that of control. Therefore, the present study provides a baseline information of the maximum limit of sesame meal inclusion for *P. hypophthalmus*.

Egg production and hatchability performance of *Ayam Kampung* MARDI using 1:8 male female ratio

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Abstract

This study was performed to provide additional information on the reproduction and performance of *Ayam Kampung* MARDI (AKM) breeders maintained at a 1:8 male to female ratio. In this study, 50 male and 395 female AKM were used and the breeding was conducted in a semi-intensive farm environment. The egg was collected and recorded daily, cleaned, disinfected and stored in the cold room starting at week 20. At the age of 31 week, the selected eggs were incubated for 21 days at the temperature of 37.5^{o}C and 56-60 relative humidity. The results showed that at the age of 20 to 23 weeks, 1200 eggs were collected and 100% of the eggs produced were small (30-40 g). At the age of 24 to 27 weeks, 2180 eggs were recorded and 53% (1175 eggs) were medium in size (40 - 55 g/egg) and the remaining 47% of the eggs were small in size. During week 28 to 31, the number of eggs produced was as high as 4080 eggs and 20% of them were large in size (816 eggs, 55-60 g/egg), 58% were medium size eggs (2366 eggs) and 22% were small size eggs (898 eggs). At the age of 31 to 34 weeks, a total of 5737 eggs produced. 40% (2295) of the eggs were in large size group, 48% (2754) of the eggs were in medium size and 12% (688) in small size egg group. During 31 to 34 weeks, 40% (2280) of the eggs were selected and incubated for 21 days. About 35% or 798 eggs hatched on the 20th day of incubation and another 20% or 456 eggs hatched on the 21st day of incubation. From these observations, AKM started to produce eggs at 20 weeks old but the eggs were small in size. The number of eggs increased as the hens grew older. At the age of 31 weeks, AKM breeders started to lay good sizes of eggs and can be incubated to produce chicks. This observation will be continued until the AKM reach 80 weeks old.

Heterozygosity studies using microsatellite markers in three commercial kampong chicken populations

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Abstract

The purity of today's kampong chickens is questionable as a result of uncontrolled breeding between exotic breeds and the local kampong chicken. Hence, the current kampong chicken population has non-standard phenotypic characteristics and do not have specific descriptions. To understand the genetic diversity of kampong chickens in Malaysia, microsatellite markers or simple sequence repeats (SSRs) were utilized to evaluate the heterozygosity among three populations of commercial kampong chicken found in Malaysia.180 individual blood samples from three populations of kampong chicken and one population of commercial broiler (KCA = 50, KCB = 50, KCC = 50 and CBr = 30) were used. Twenty-four microsatellite loci recommended by FAO were used in this study on DNA extracted from blood samples. The observed heterozygosity (Ho) in KCA, KCB, KCC and CBR are 0.39, 0.41, 0.46 and 0.42, respectively. This was lower than the expected heterozygosity (He) in all four populations: KCA (0.67), KCB (0.67), KCC (0.68) and CBR (0.69). For all of the loci used, the mean He was higher than the mean Ho. For the PIC value, out of 24 microsatellites, 20 microsatellites were found to be highly informative with PIC>0.5. From the study we found that there might been bias in sampling or possible inbreeding mating system thus resulting observed heterozygosity (Ho) to be lower than expected heterozygosity (He). 20 microsatellites with PIC>0.5 can be use in the future for genetic population study because the number of alleles identified at each locus for each population can be used as an indicator of genetic variability.

The growth performances of MARDI village chicken (*Ayam Kampung* MARDI) fed on palm kernel expeller (PKE) based feed (PKfeed)

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Abstract

The objective of this experiment was to evaluate the growth performances of *Ayam Kampung* MARDI (AKM) fed on palm kernel expeller (PKE) based feed (PKfeed). Two diets were compared i.e PKfeed that contained 25% PKE supplemented with mannnase (PKzyme) and commercial diet (served as a control). PKfeed was formulated to contain similar crude protein (CP) as in commercial diets both for starter and grower but with lower metabolizable energy (AMEn). CP contents in PKfeed and commercial diets were 22.7 and 23% for starter and 20.1 and 19.9% for grower, respectively. Meanwhile, AMEn values in PKfeed and commercial diets were 11.92 and 14.14 MJ/kg for starter and 11.95 and 14.12 MJ/kg for grower, respectively. A total of 60 1-day-old chicks were randomly allocated to 6 groups (10 birds/group) and the groups were assigned to one of the experimental diets. The birds were fed *ad libitum* for 12 weeks and the performance parameters were monitored weekly. The results showed that there were no significant differences ($P>0.05$) on the final weight, weight gain and feed conversion ratio (FCR) between the treatment groups. On the other hand, feed intake for AKM fed on the commercial diet (5.81 ± 0.01kg) was significantly higher ($P<0.05$) than that of PKfeed (5.02 ± 0.23kg). These results indicate that despite lower AMEn in PKfeed, AKM birds were able to utilised PKfeed to achieve similar performance as those fed with commercial diets. These results also indicate that AKM requires only 11.93 MJ/kg AME to achieve 1.63 ± 0.12kg with FCR of 3.17. In conclusion, this study suggested the potential of PKE as a feed ingredient for AKM and the energy requirement for the growth of AKM was lower than those provided in commercial diets. Feeding AKM with higher AME diets could lead to nutrient wastage and higher feed and meat production cost.

The effect of different energy and protein levels on growth performance of MARDI village chicken or *Ayam Kampung* MARDI (AKM) at breeder phase

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ABSTRACT

Feed is the heart of poultry industry therefore it should be formulated according to its nutritional requirement. Currently, slow growing village chicken meat and eggs have been becoming increasingly popular among Malaysian consumers due to its taste and a sustainable poultry farming for small farmers. However, to date nutritional requirement for village chicken is not available to be used in formulating a cost-effective feed. Thus, this study was conducted to determine the effect of different energy and protein levels on growth performance of MARDI village chicken or *Ayam Kampung MARDI* (AKM) at breeder phase. It was hypothesized that lower level of energy and protein do not affect growth performance of breeder. The experiment was conducted as a 2 x 3 factorial arrangement of treatments with 2 levels of metabolizable energy (ME) (11 and 13 MJ/kg) and 3 levels of protein (14, 16 and 18%). A total of 90 AKM female and 18 male breeders aged 31-week-old were randomly allocated to 6 groups in triplicates, with 5 females and 1 male breeders per replicate. The experimental diets were fed at libitum for 6 weeks and the performance parameters were monitored weekly. The results showed that protein and energy levels have no significant effect on bodyweight and weight gain of both female and male breeders after 6 weeks feeding period. However, there was a significant interaction effect between protein and energy level on final weight of female breeders. At 14% protein, bodyweight of female breeders significantly increased from 1.99 to 2.29 kg when energy was increased from 11 to 13 MJ/kg. This indicates female breeder would require higher energy level to achieve higher bodyweight. Meanwhile, protein levels above 14% do not benefit the growth of AKM female breeder and should be avoided as it could lead to nutrient wastage.

In vitro gas production and nutrient composition of *Moringa oleifera* and *Sesbania grandiflora* leaves

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ABSTRACT

In vitro gas production technique is one of the techniques used in determining the nutritive value of the feedstuffs for ruminants. A study was conducted to determine the nutrient compositions of *Moringa oleifera* and *Sesbania grandiflora* leaves via proximate analysis and gas production (GP) by *in vitro* gas technique. Leaves from indigenous tree species namely *Moringa oleifera* and *Sesbania grandiflora* were collected at MARDI Kluang, Johor. A completely randomized design (CRD) with triplicates was used to compare the volume of *in vitro* gas production in both samples. The gas production was continuously measured by incubating the samples in buffered rumen fluid for 24 hours. Cumulative gas production was recorded at 0, 4, 8, 12, 16, 20, and 24 hours post incubation in a water bath at 39ºC. The results of chemical analysis of both samples showed that *Moringa oleifera* contained higher crude protein (CP) (36.4%) compared to *Sesbania grandiflora* (31.3%). The content of crude fiber (CF) in *Moringa oleifera* (10.1%) was similar to that of *Sesbania grandiflora* (10.4%). Meanwhile, the content of detergent fibres (NDF and ADF) in *Moringa oleifera* and *Sesbania grandiflora* were 41.4%, 16.3%, 38.2% and 17.6%, respectively. A significantly higher cumulative gas production at 24 hours was observed for *Sesbania grandiflora* (41.6 ml/g DM) compared to *Moringa oleifera* (39.9 ml/g DM). Based on the amount of gas produced within 24 hours incubation, it is concluded that *Sesbania grandiflora* has high rate of feed digestion compared to *Moringa oleifera.*

Effect of feeding yellow mealworm, *Tenebrio molitor* with different water sources of bedding material on the survival of beetles and larvae production

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Abstract

Yellow mealworm, *Tenebrio molitor* is gaining attention as a sustainable and high-quality protein source in animal diet. In Malaysia, yellow mealworm is produced by indoor farming to ensure the availability and sustainability of the larvae. In insects farming, water source is one of the important factors that should be concerned. For this study, the effect of feeding *T. molitor* with five water sources with bedding (Diet 1-Carrot, Diet 2-Potato, Diet 3-Pumpkin, Diet 4-Pineapple and Diet 5-Banana frond) on survival of beetles and larvae production were evaluated. The experiment was set up in controlled environment at Insect Laboratory, MARDI. One hundred and fifty beetles were introduced into trays containing wheat pollard as the bedding and one of the water sources (30g) in triplicates. After 21 days, the alive beetles were counted and removed from the tray. The feeding of the water sources at the rate of 60g/week was continued until first pupae was observed in about 85 days. Then, the larvae were harvested and weighed. From the results obtained, there was significant difference ($p<0.005$) of beetle's survival among treatments. The beetles fed with carrot showed better survival than other treatments. Low survival of *T. molitor* from banana frond diet probably due to low water holding capacity of banana front, resulting in insufficient water for the beetles. However, for larvae rearing, there was no significant difference ($p>0.05$) among the treatments on feed intake and final weight of yellow mealworm. Based on this study, it is suggested that carrot could be used as water source for *T. molitor* breeding in order to maintain beetle survival and larvae production.

The effects of feeding supplemented sago pith waste and coconut meat waste diet on growth performance of local goats

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Abstract

A feeding trial was conducted to evaluate the effects of feeding supplemented sago pith waste (SPW) and coconut meat waste (CMW) to local Katjang goats. Twenty growing goats of 5 months of age weighing approximately 7kg ±0.5kg were used. The goats were then randomly allotted into 5 treatment diets: T1S10 Diet 1: 10% SPW was added to the feed mixture, T2C10 Diet 2: 10% of CMW was added, T3 SC10 Diet 3: 10% SPW + 10% CMW were added; T4SC20 Diet 4: 20% SPW + 20% CMW were added and T5Cn /control group Diet 5: control group, normal commercial pellet was offered to the animals without any SPW or CMW, with 4 animals per group. The feeding trial was conducted for 120 days. The results showed that the final body weight was significantly higher ($P<0.05$) in T1S10 (10% SPW) at 25.5 kg compared to the other groups. Body length of T3SC10 and T4SC20 (54.67 and 53.00cm, respectively) goats were significantly ($P<0.05$) longer than those in other treatment and control groups. Final chest girth also revealed that the control (T5Cn) was the smallest ($P>0.05$) at 75.67cm. There were positive correlations between feed intake and body weight ($r=0.717$), height ($r=0.879$) and chest girth ($r=0.821$). The average final body weight (25.5kg), average daily gain (42.1g) and daily feed intake (425g) were highest ($P<0.05$) for the diet T1S10 compared with the other treatments and the control. There was no significant difference between treatments T3SC10 and T4SC20 in terms of total weight gain, average daily gain, daily feed intake and feed conversion ratio. The high growth performance of the goats indicates that the SPW and CMW have good potential to be incorporated in the small ruminant feed.

An *in vitro* study for determining the potential of papaya leaves as natural anthelmintic for goats

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Abstract

In developing countries, small scale farmers are trying to treat their infected animals by using medicinal herbs that are locally available and low cost. Papaya (*Carica papaya L.*) known to have anthelmintic property is commonly found in Malaysia and can be used to treat helminthiasis disease. The objective of this experiment was to determine the potential of papaya leaves as the source of local organic anthelmint using *in vitro* technique. About one kilogram of papaya leaves were collected, dried at 60°C for 48 hours and ground to fine particles. Papaya leaves extract (PLE) were prepared by extracting ground papaya leaves in different concentrations (2, 4, 6, 8 and 10 mg/ml water). Faecal juice agar (FJA) was used as a base medium. A 100µL of FJA and 100µL different concentration of PLE were added in individual well of 96 well plate. FJA without PLE served as a negative control while 100µL of FJA with 0.2 mg/ml Levamisole served as positive control. Approximately 20 – 40 larvae were added into each well before incubated at 30°C. The effect of the PLE on the larvae motility was assessed by counting the numbers of motile and immotile larvae at 24 and 48 hours under the microscope. The percentage of immotile larvae at 24 hours incubation in 2, 4, 6, 8 and 10mg/ml PLE were 66.85%, 40.00%, 58.45%, 52.90% and 69.20% respectively. While, at 48 hours 78.17%, 81.00%, 88.23%, 84.53% and 92.65% respectively. Larvae in positive control were 100% immotile. The results revealed that higher PLE concentrations showed positive effects on larvae motility, but further studies are needed to determine the optimum level and the feeding effect of papaya leaves on animals due to the moderate quality of the leaves.