EVALUATION OF SESBANIA SEED (*Sesbania sericea*) AS A FEED SUPPLEMENT TO FREE-RANGE CHICKEN

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JUDUL: EVALUATION OF SESBANIA SEED (SESBANIA SEPICEA) AS A FEED SUPPLEMENT TO FREE-RANGE CHICKEN

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ABSTRACT

This study was conducted from June 2013 until October 2013 at *Makmal Ladang,* Animal Nutrition and Poultry Science Laboratories of SPL, UMS-Sandakan. The objective of this study was to evaluate the *Sesbania sericea (S. sericea*) seed as a feed ingredient for free-range chicken. Activities done under this study were gathering brief information on some basic botanic parameters of *S. sericea,* its proximate composition and feeding value to the growing free-range chicken. The feeding trial was continued for a period of 60 days. Two groups (control group with no supplement and *S. sericea* supplemental group with 18.75g/chicken/day) of chicken were maintained in the feeding trial having at least 9 individuals under each. The data of feeding trial were analyzed under two sample t-test at 0.05% level of significance. Proximate composition showed that *S. sericea* seed contains 24.5% crude protein along with the other components as like as a protein-rich ingredient. Feeding of the *S. sericea* seed did not affect the body weight gain of the experimental chicken significantly ($p>0.05$). The intake of *S. sericea* seed by the bird was remarkably low (3.55g/chicken), which indicated its low palatability. Based from the results of proximate analysis suggested that *S. sericea* seed can be considered as a protein rich supplementation item to free-range chicken but needs intervention on feeding methods just to increase the consumption rate.

PENILAIAN BIJI SESBANIA SERICEA SEBAGAI MAKANAN TAMBAHAN TERHADAP SISTEM LEPAS AYAM

ABSTRAK

Kajian ini telah dijalankan dari JUNE 2013 hingga OCTOBER 2013 bertempat di makmal ladang, makmal nutrisi haiwan dan sains unggas SPL, UMS-SANDAKAN. Objektif kajian ini dilakukan adalah untuk mengenal pasti dan menilai spesis pokok Sesbania sericea (S.sericea) sebagai makanan tambahan untuk ayam kampung melalui system lepas ayam. Aktiviti yang dilakukan dalam kajian ini adalah mengumpul maklumat ringkas mengenai beberapa parameter asas botani terhadap S.sericea, komposisi proksimat S.sericea dan juga jumlah pemakanan untuk makanan ayam kampung melalui system lepas ayam. Terdapat dua kumpulan untuk eksperimen ini iaitu kumpulan kawalan dan juga kumpulan yang diberi makan benih S.sericea sebanyak 18.75g/seekor/sehari. Setiap kumpulan eksperimen ini mempunyai sebanyak 9 ekor ayam untuk tujuan eksperimen ini. Data serta maklumat yang dikumpul daripada ayam yang diberi makan benih S.sericea akan dianalisis dengan kaedah dua sampel ujian-t di peringkat 0.05% kepentingan. Komposisi proksimat menunjukkan bahawa benih S.sericea memgandungi 24.5% protein mentah . Memberi makan benih S.sericea terhadap ayam kampung tidak menjejaskan berat badan ayam eksperimen dengan ketara ($p>0.05$). Namun begitu, pengambilan benih S.sericea oleh ayam kampung berkenaan adalah amat rendah sebanyak 3.55g/seekor/hari, hal ini mungkin disebabkan oleh kadar penerimaan ayam terhadap benih ini adalah sangat rendah. Secara kesimpulannya, keputusan daripada analisis tersebut mencadangkan bahawa benih S.sericea boleh dianggap sebagai suplemen yang kaya dengan sumber protein. Kajian yang lebih mendalam terhadap cara penyediaan benih S.sericea terhadap ayam kampung boleh dilakukan untuk mengenalpasti cara meningkatkan kadar penerimaan ayam kampung terhadap benih S.sericea.

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LIST OF SYMBOLS, UNITS AND ABBREVIATIONS

%	Percentage
>	More than
<	Less than
°	Degree
℃	Degree Celsius
AOAC	Association of Official Analytical Chemists
CF	Crude Fibre
CP	Crude Protein
CRD	Complete Randomized Design
DM	Dry Matter
EE	Ether Extract
g	gram
H_2SO_4	Sulphuric acid
HCl	Hydrochloric acid
Kg	Kilogram
m	Metre
M	Molarity
Min	Minute
mm	Millimeter
ml	Mililitre
N	Nitrogen
N	Normality
NaOH	Sodium Hydroxide
P	Phosphorus
S	Sulphur
T1	Treatment 1
T2	Treatment 2
TC	Treatment Control
w	Weight
MT/ha	Metric tan per hectare

LIST OF FORMULAE

CHAPTER 1

INTRODUCTION

1.1 Introduction

The high cost and limited production of feed for the poultry in Malaysia become the problem for poultry industry nowadays. This can be seen where there is competition of food, for example, human food ingredients like maize and soybean those are used for feed industries other animals (Yegani, 2008). Other than that, Malaysia is too much dependent on the importation of soya bean and corn as the poultry and swine diets (Alimon, 2009). This situation makes the feed production cost higher. Hence, the alternative ingredient should be uses in order to reduce the demand and the competition with the human food and to produce readily available livestock feed from Malaysian own resources.

A lot of unconventional feed supplementation has already been tested in Malaysia as the resolution to avoid the import of costly items from abroad for the production of poultry feed in Malaysia. Other than that, more byproduct has been using as feed ingredients for livestock. As a part of the continuous effort, *Sesbania sericea* (*S. sericea*) seed can also be tested as poultry feed because this seed have high protein value to chicken. *S. sericea* is the plant that comes from big genus *Sesbania.*, which has many species with distinct characteristics. Other than that, *Sesbania* was belongs to family of Fabacea with some aquatic species. *S. sericea* also known as "Silky Sesban" and called "Papagayo" in Spanish.

The mature height of this Sesbania varies between 1 to 6 meter. This plant can grow rapidly and the seedlings are about 10 cm tall at the end of one month and reach 2 to 6 m in 6 months. Some Sesbania family species have toxicity effects and Anti-nutritional factor (ANF) towards the livestock animals and this can reduce the performance of poultry. But some reports shows that *S. sericea* have no toxicity

towards animals and the crushed seeds of this species were feed to chickens at 1 percent body weight each day for 3 days without any signs of toxicity (Evans and Rotar, 1987).

Village chicken also called the free-range chicken is a common type of livestock animals in rural areas. Village poultry comprises of local genetic stock and are raised extensively in relatively smaller numbers which is 1-50, although more commonly 5-15 birds. The free-range chicken obtains most of their diet from scavenging food and water around the home that include household wastes. In addition, village chicken is not usually confined. The investment of this village chicken is minimum. Other than that the local village chicken can adapt with harsh condition of environments (Alders and Spreadbrow, 2001).

The keeping of village chicken in South-east Asian countries has been practiced for the centuries and as a backyard operation among rural families. The village chicken in South-East Asia is Free-Range chicken and semi-intensive type that is still popular in rural areas. In Malaysia, the standing population of indigenous chicken in 1994 was around 10 million that comprised 3% of the total world population and the annual production of village chicken was around 15,000 tons of meat and 250 million eggs (Seri-Masran, 1996).

Supplementing of these village chickens with commercial feed or single ingredients like maize or soybean what is being currently practiced in Malaysia is a big challenge for this sector in terms of cost-effectiveness and availability. Therefore, testing of any potential unconventional feed ingredient to supplement the village or farm chicken will be very relevant and promising in Malaysian context. The proposed study will evaluate the locally grown *S. sericea* seed for their nutritional value using both the chemical and biological approaches. To our knowledge, only limited number of experiment has been done on *S. sericea* seed for testing its biological value in broiler only, and information on using of free-range chicken is completely lacking. Besides, the nutritional value and toxicity level of the locally grown Malaysian wild *S. sericea* seed to poultry will be known for the first time.

1.2 Justification

S. sericea will be using in this research because it is grown in wild, needs no cost of cultivation, unconventional in nature and human will never compete with it for their

food. Supplementation of this new ingredient will help to boost the production of village free-range chicken with minimum cost. This research will help to cut the feed import cost for poultry industry. It will be a good example of utilization of natural resources.

1.3 Hypotheses

Ho: Feeding of *S. sericea* seed have no effect on the performance of free-range chicken

Ha: Feeding of *S. sericea* seed can alter the performance of free-range chicken

1.4 Objectives

1. To generate the botanical data on growth and seed yield of wild *S. sericea* grown in Sabah.
2. To determine the proximate composition of *S. sericea* seed.
3. To study the effect of supplemental feeding of *S. sericea* seed on the growth, mortality and feed intake of local free-range chicken.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Origin and distribution of *S. Sericea*

S. sericea is the genus of *Sesbania* and come from the family of *Fabaceae* (*Leguminosae*) with the subfamily of *Faboideae* and tribe name *Sesbanieae*. *S. sericea* also synonymous with *Coronilla sericea* Willd. It is also called as "*Turi*" in Malay and papagayo in Spanish. *S. sericea* is very native to Sri Lanka (Howard, 1988) tropical Asia (Long and Lakela, 1976) tropical Africa and Carribeans (Evans and Rotar, 1987), Arabia, Indo China, Thailand and also grown in South-East Asian. It was also introduced to the West Indies and northern South America. Hence, this can be proved that this species has already been widely introduced and become more common to many areas.

The species of *S. Sericea* has been found in Malaysia and have many different species which is *S. sericea* (Willd.) Link, *S. sericea* (Willd.) Link var. glabra Domin, *S. sericea* (Willd.) Link var. inermis Domin and *S. sericea* (Willd.) Link var. subsinguliflora Domin. The most commonly found *Sesbania* in Malaysia and Borneo is *S. sericea* (Willd.) Link.

The *S. sericea* has not been commercialized as the feed for chicken or other livestock species because people rarely know about the constituent and nutritional value of this plant especially for its seed. Although has been said that *S. sericea* is not toxic to farm animals like chicken (Evans and Rotar, 1987).

Table 2.1 Distribution of *Sesbania* species in various regions of the worlds.

Region	No.of species	Source
Africa	33	Gillet, 1963
Australia	10	Burbidge, 1965
Hawaii	7	Char, 1983
Asia	Unknown	Char, 1983

2.2 Botanical Characteristics of *S. sericea*

2.2.1 Morphology

Firstly, *S. sericea* is short-lived woody shrub and can reach the height of 1-6 m and with basal diameters of 10 m. A single stem is usually developed unless the plant sprouts after damage. Secondly, stem are usually unbranched. This species have a weak prickles and the stem are green when young and turning grey after old. The white lateral roots are relatively thick (3 to 5 mm) and support many nodules with reddish center and abundant fine roots. The racemes have two to eight yellow, greenish-yellow, or orange flowers. The pods is the place for holding the seed, the pods is usually in brown in color and can be developed to 10 to 20 cm long, 3 mm broad, and contain 20 to 30 seeds (Howard, 1988; Liogier, 1988; Nelson, 1996). Photographs given below are the plant and seed of ***S. sericea.***

Pictures 2.1 Pictures of *S. Sericea* tree

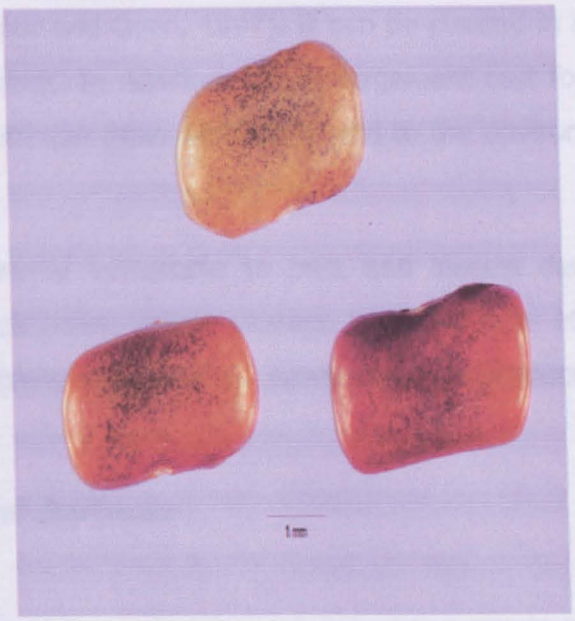

Figure 2.2 Pictures of *S. sericea* seed

2.2.2 Ecology and Propagation

S. sericea plant is found living in many types of soils, hence it can be planted in a diverse geography. However, these species best lives on moist alluvial soil and it can grow on the soil with low fertility and very poorly drained. This plant is highly intolerant of shade and must have disturbed soil to be germinated. The plants of *S. sericea* grown rapidly and the seedlings can reach 10 cm tall at 1 month and reach 2 to 6 m of height in 6 months.

S. sericea plant can yield 26.8 MT /ha (fresh weight) vegetative parts in a 84-day growing period (Evans and Rotar, 1987). This plant also can live to 8 months and little over a year by depending on the conditions. The weighed of air-dry pod of seed in average 0.378 ± 0.0008 g/pod. The germination of these species is epigeal. *S. sericea* can be planting commercially by sowing it into a moist or prepared seedbed which is sufficient enough.

2.2.3 Ethno-botanical Uses and Benefits

S. sericea are more commonly used as a green manure in India and this plant is consumed by cattle as pastures. The seed from this species does not contain any toxic components that might affect the animal that ate it, this been shown when the crushed seed was being feed to the chicks does not have any side effects of toxicity (Evans and Rotar, 1987). This species of *Sesbania* can yield large amounts of organic matter in a

short period of time (Ipor and Oyen, 1997). It can be planted in any type of land that is rich in nutrients content. In addition, the management cost for this plant is almost zero because these plant can grow and live in wild to the environment without proper management.

S. sericea is rarely vulnerable to pest and insects damage and death. In addition, the *S. sericea* shows minor damage when become attacked by the insect pest. The yield of organic matter of *S. sericea* can be produced in short period of times.

2.3 Medicinal Uses of *Sesbania*

2.3.1 Astringent

Astringent that is present in *Sesbania* species make it medicinal qualities because it can be extract as juices. They have the ability to contract the body tissues and blood vessels. This can help in relieving fever and can reduce fluid discharge and subsequent drying of mucous membranes to promote healing. It has also been claimed to bring the relief of nasal congestion and rhinitis and associated headache (Watt and Breyer-Brandwijk, 1962).

2.3.2 Anthelmintic

The *Sesbania* can also be used as an anthelmintic against tapeworms and roundworms in humans. According to (Watt, 1983), the mixture of ground seed and flour made into a paste is used for treating ringworms.

2.3.3 Antibiotic

The leaves, barks and roots of *Sesbania* can be used as a remedy for wide range of diseases including the sore throat, gonorrhoea, syphilis, yaws, fits and jaundice (Watt and Breyer-Brandwijk, 1962).

2.3.4 Contraceptive and Abortifacient

The extract of *Sesbania* flower can help female to conceive and on the other hand, can cause the pregnant to be aborted in 54-77% cases depending on what concentration of extract ingested (Pakrashi *et al.*, 1976).

2.3.5 Anti-tumoric

According to Powell *et al.* (1976), the extraction of seed from *S. vesicaria, S. punicea* and *S. drummondii* were cytotoxic to KB cell culture and were active against lymphocytic leukemia P-388 in mice.

2.4 Potentials of *S. sericea* seed as a feed ingredient for chicken

There is controversy on the effect of feeding *S. sericea* seed to poultry. Some researchers have reported some *Sesbania* seeds to be toxic to a range of animals. While, the *S. sericea* seeds has been claimed to be non-toxic to chicken at 1% of body weight (Evans and Rotar, 1987).

2.5 Uses of Unconventional feed Ingredients for Poultry in Malaysia

The term "unconventional feed" (UCF) is the feedstuffs or the feed supplementation that not usually being used in standard and commercial compounded feed manufacturing (Alimon, 2009). The UCF are only used when there is a low production of conventional feed and the higher prices of conventional feed in the market. Malaysia has diverse type of unconventional feed ingredients like palm kernel cake, tapioca root, coconut meal and so on for poultry. Upon nutritional analyses successful feeding trial of *S. sericea* seed grown in Malaysia can be commercialized and even can replace the conventional feedstuff if it is taken seriously. The anti-Nutritional factor, saponins and canavanine, present in *S. sericea* might not be a problem for indigenous free-range chicken because they are hardy and tolerant to many unusual stresses (Evans and Rotar, 1987).

2.6 Research Gap and the Scope of Present Study

From the above review of literatures, it is clear that only limited number of researches have been done on the botanical information and use of locally grown *Sesbania* seed in Malaysia as poultry feed. Therefore, generating information on the botany and nutritive value of *S. sericea* seed along with its feeding trial on free-range chicken might be worthy to boost the production of village chicken with minimum feed cost.

CHAPTER 3

MATERIALS AND METHODS

3.1 Statement of the Experiment

The experiment was conducted at SPL *Makmal Ladang* of UMS Sandakan Campus. The tentative length of the experimental period was done from June 2013 until October 2013 that including the field and laboratory works. The supplemental feeding trial of *S.sericea* seed was done in SPL *Makmal Ladang*, while the laboratory works for analyzed the nutritive value of *S. sericea* seed as poultry feed was done at Animal Nutrition and Poultry Science Laboratories of SPL.

3.2 Experimental Chicken

Experimental birds that being used for this experiment was the free-range chicken that bought from Bantayan Poultry Breeding and Research Centre in Tuaran. Age of the chicken bought was 2-day old chick and being kept for six weeks before used for the field experiment. The free-range chicken kept for the six weeks because the growth rate was slow and need to let them adapt with the new environment before the field experiment started.

3.3 Study on the Botanical Information of *S. sericea*

The average height, number of main and sub-branches, number of seed pods hold, seeds per pod, weight per single seed, color of the seed, and the weight of whole seeds per tree was determined from an observation made on 30 *S. sericea* plants that grown at 3 different locations of Sandakan area. The measuring tape and digital balance was uses to generate this data.

3.4 Proximate Analyses of *S. sericea* seeds

The dry matter and proximate components; moisture, crude protein, crude fire, ether extract, and ash was determined in *S. sericea* seed at SPL Nutrition Laboratory according to the protocol stated below:

3.4.1 Determination of Moisture

Moisture was determined by the loss in weight that occurs when a sample was dried to a constant weight in an oven. About 2g of a seed sample was weighed into a silica dish previously dried and weighed. The sample then was dried in an oven for 65° C for 36 hours, after that, cool in desiccators and weighed. The drying and weighing continues until a constant weight was achieved

$$\text{Moisture Percent} = \quad = \frac{100(W1-W2)}{W1-W} \tag{3.1}$$

Where,

W = Wt. of moisture cup

W1 = W. of moisture cup + sample

W2 = W. of moisture cup + sample after drying

DM per cent = 100 -moisture

Since the water content of feed varied widely, ingredients and feed are usually compared for their nutrient content on moisture free or dry matter (DM) basis.

Percentage of DM= 100- Percentage of Moisture

3.4.2 Determination of Crude Fiber

The organic residue left after sequential extraction of feed with ether can be used to determine the crude fiber, however if a fresh sample was used, the fat in it could extract by adding petroleum ether, stir, allow it to settle and decant. The fat-free material was transferred into a flask/beaker and 200ml of pre-heated 1.25% H_2SO_4 was added and the solution is gently boiled for about 30 mins, maintaining constant volume of acid by the addition of hot water. The Buckner flask funnel fitted with What-man filter is pre-heated by pouring hot water into the funnel. The boiled acid sample mixture was filtered hot through the funnel under sufficient suction. Then, the residue was washed several times with boiling water (until the residue is neutral to litmus

paper) and transferred it back into the beaker. The 200ml of pre-heated 1.25% Na_2SO_4 was added and boiled for another 30 mins. Filter under suction and wash thoroughly with hot water and twice with ethanol. The residue was dried at 65°C for about 24hours and weighed. The residue was transferred into a crucible and place in muffle furnace (400-600°C) and ash for 4hrs, then cool in desiccators and weigh.

$$\% \text{ Crude fibre} = (m3 - m1 - m4 - m5) \times 100/m2$$

$$\text{Blank value} = (m7 - m5) \qquad (3.2)$$

3.4.3 Determination of Crude Protein

Crude protein was determined by measuring the nitrogen content of the feed and multiplying it by a factor of 6.25. This factor is based on the fact most of protein contains 16% nitrogen. Crude protein was determined by Kjeldahl method. The methods involving are digestion, distillation and titration.

Digestion: About 2g sample weighed into kjeldahl flask and add 25ml of concentrated sulphuric acid, 0.5g of copper sulphate, 5g of sodium sulphate and a speck of selenium tablet. Apply heat in a fume cupboard slowly at first to prevent undue frothing, continue to digest for 45min until the digesta become clear pale green. Leave until completely cool and rapidly add 100ml of distilled water. Rinse the digestion flask 2-3 times and add the rinsing to the bulk.

Distillation: Markham distillation apparatus was used for distillation. Steam up the distillation apparatus and add about 10ml of the digest into the apparatus via a funnel and allow it to boil. Add 10ml of sodium hydroxide from the measuring cylinder so that ammonia not lost. Distil into 50ml of 2% boric acid containing screened methyl red indicator.

Titration: The alkaline ammonium borate formed was titrated directly with 0.1N HCl. The titre value which is the volume of acid used was recorded. The volume of acid used was fitted into the formula which becomes

$$\% \text{ N} = \frac{(S-B) \times N \times 0.014}{\text{Weight of the sample} \times V} \times 100$$

$$\% \text{ Crude protein} = 6.25 \times \% \text{ N} \qquad (3.3)$$

3.4.4 Determination of Ether Extract

The ether extract of a feed represents the fat and oil in the feed. Soxhlet apparatus is the equipment used for the determination of ether extract. It consist of 3 major components

1. **An extractor**: comprising the thimble which holds the sample

2. **Condenser**: for cooling and condensing the ether vapour

3. **Flask**: 250ml flask

Procedure: about 150ml of an anhydrous diethyl ether (petroleum ether) of boiling point of 40-60 °C was placed in the flask. 2-5g of the sample is weighed into a thimble and the thimble is plugged with cotton wool. The thimble with content is placed into the extractor, the ether in the flask was then heated. As the vapour reaches the condenser through the side arm of the extractor, it condenses to liquid form and drop back into the sample in the thimble, the ether soluble substances are dissolved and were carried into the solution through the siphon tube back into the flask. The extraction continues for at least 4hrs. The thimble is removed and most of the solvent was distilled from the flask into the extractor. The flask was then disconnected and placed in an oven at 65 °C for 4hrs, cool in desiccators and weighed.

$$\%\ \text{Ether extract} = \frac{Weight\ of\ flask + extract - tare\ weight\ of\ flask}{Weight\ of\ sample} \times 100 \qquad (3.4)$$

3.4.5 Determination of Ash

Ash is the inorganic residue obtained by burning off the organic matter of feedstuft at 400-600 ° C in muffle furnace for 4hrs. 2g of the sample was weighed into pre-heated crucible. The crucible was placed into the muffle furnace at 400-600 °C for 4hrs or until whitish-grey ash was obtained. Then, the crucible was placed in the desiccators and weighed

$$\%\text{Ash} = \frac{100(W2 - W)}{W1 - W} \qquad (3.5)$$

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