EFFECT OF DIFFERENT HERBS ON EGG PRODUCTION IN LAYING HENS

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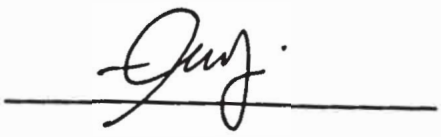

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ABSTRACT

Twenty-one week old of 96 hens were assigned to a 4 X 6 X 4 factorial arrangement as a completely randomized design with 4 treatments of 6 replicate for each treatment. Day Old Chick (DOC) raised in Poultry Research Facility, Faculty of Sustainable Agriculture, Univeristi Malaysia Sabah, to study the effect of different type of herbs (Turmeric-TR, Daun Kesum-DK, Bawang Dayak-BWD) on egg production performance of Bovan Brown chicken breeds. Egg performance may be depending on the dosage of substance used. Feed formulation nutrient analysis was done to study the content of feed. There is evidence that dietary plants affect the egg production which might be an interesting subject to the egg processing industry. It is concluded that the supplementation of layer diets with Turmeric, Daun Kesum, and Bawang Dayak herbs did not significantly affect parameters ($P>0.05$) at 1% inclusion on the 3rd week of experiment.

KESAN HERBA YANG BERLAINAN TERHADAP PENGELUARAN TELUR AYAM PENELUR

ABSTRAK

96 ayam penelur berusia dua puluh satu minggu dengan faktorial 4 X 6 X 4 sebagai reka bentuk eksperiment. Day Old Chick (DOC) dibesarkan dalam Fasiliti Penyelidikan Ayam, Fakulti Pertanian Lestari, Univeristi Malaysia Sabah, untuk mengkaji kesan herba yang berbeza (Turmeric-TR, Daun Kesum-DK, Bawang Dayak-BWD) terhadap prestasi peneluran ayam Bovan Brown. Prestasi telur mungkin bergantung kepada dos bahan yang digunakan. Analisis formula nutrien makanan dilakukan untuk mengkaji kandungan makanan. Terdapat bukti bahawa tumbuh-tumbuhan pemakanan mempengaruhi pengeluaran telur yang mungkin menjadi subjek yang menarik kepada industri pemprosesan telur. Kesimpulannya, makanan tambahan dengan tahap 1% ke dalam makanan ayam dengan Kunyit (Turmeric-TR), Daun Kesum-DK, dan Bawang Dayak–BWD, tidak menunjukkan kesan ketara terhadap parameter ($P>0.05$) pada minggu ketiga eksperimen.

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LIST OF SYMBOLS, UNITS AND ABREVIATIONS

BD	Basal diet
BWD	Bawang dayak
BWG	Body weight gain
CRD	Completely randomized design
DK	Daun kesum
DMRT	Duncan's multiple range tests
DOC	Day old chick
EM	Egg mass
EP	Egg production
EW	Egg weight
FBW	Final body weight
FCR	Feed conversion ratio
FI	Feed intake
GLM	General linear model
IBW	Initial body weight
MDCP	Mono dicalcium phosphate
NRC	National research council
TR	Turmeric

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Feed of an animal is a major component in helping survival of animal, maintenance of animal health, productive and reproductive performance. During the last decade, phytogenic compounds have attracted a lot of attention for their potential role as alternatives to antibiotic growth promoters in animal nutrition. Therefore, the poultry industry is actively searching for alternatives to conventional antibiotics. Interestingly, herbs and spices are well identified to exert potent antimicrobial properties *in vitro* against various pathogens, and as alternative feeding strategy to replace antibiotic growth promoters (Smith-Palmer, 1998). As a matter of fact, egg producers are looking for strategies to optimize feed efficiency of their flocks, especially in times of volatile feed prices. The aim of this work is to review the current scientific literature on the use of herbs in layering hen nutrition. The efficiency of herbs application in layering hen nutrition depends on many factors such as composition of feed and overall farm management. Turmeric, Daun Kesum and Bawang Dayak herb has natural non antibiotic growth promoter content in poultry nutrition. However, the mechanism behind growth promotion are still far from being elucidated, as data on phytogenic effects on nutrient digestibility, gut function and the immune system are still weak. Thus, our knowledge regarding the modes of action and aspects of their application is still limited. Therefore, the aim of the current study was to investigate the effect of Turmeric, Daun Kesum and Bawang Dayak on egg production performance in laying hens.

The research hypothesis test is that dietary supplements with herbs would improve the performance of laying hens.

1.2 Justification

Dietary supplementation of feed additives improves the nutrients utilization, and productivity of livestock. Commonly used feed additives are chemicals such as free-flowing agents, antioxidants, pelleting additives which usually improve productive performance of hens. Besides being expensive, effect of some of such feed additives is temporary and some feed additive such as antibiotics creates risk of antibiotic residues in animal products. Therefore, the search for effective, safe and economic feed additives has become the necessity of the day. With the demand of organic food, attention has been shifted to herbal feed additives. Parts of plants with the higher concentration of active substances are considered as herbs. Usefulness of herbal feed additives depends on the species, its habitat (soil, rainfall, temperature and solar exposure), harvest time, storage conditions and form of feeding. Unlike chemical drugs, herbs are not having well defined active substance with known mode of action; however, herbs have multifarious effects (Windisch *et al*, 2008).

1.3 Objectives

The objectives of this study are:

1.3.1 To determine the effect of Turmeric, Daun Kesum and Bawang Dayak supplementation on egg production performance in laying hens.

1.4 Hypotheses

H_o: Supplementation of Turmeric, Daun Kesum and Bawang Dayak in laying hen diet did not improve the egg production.

H_o: Supplementation of Turmeric, Daun Kesum and Bawang Dayak in laying hen diet improve the egg production.

CHAPTER 2

LITERATURE REVIEW

2.1 Bovan Brown

The Bovan Brown is a hybrid type of Sex Link chicken. With roots dating back to the beginning of the 20th century, Institute of Selection Animal (ISA) emerged as the world's leading breeder of brown laying hens that with each generation lay more eggs for a longer period of time. It is thought to have been the result of a complex series of crosses including but not limited to Rhode Island Reds and Rhode Island Whites, and contains genes from a wide range types of breeds. Bovan Brown is known for its high egg production of approximately 300 eggs per hen in the first year of laying (Wikipedia, 2017) and also thrives in both traditional and alternative production systems and in different climatic conditions.

2.2 Turmeric (*Curcuma longa)*

Turmeric or tumeric (*Curcuma longa*) is a rhizomatous herbaceous perennial plant of the ginger family, Zingiberaceae. Turmeric is a plant-derived product with a long history in human nutrition as spices in different parts of the world. Curcumin, the yellow pigment of turmeric, has been reported as the main active component in turmeric (Aggarwal *et al*, 2003). The active and main ingredient found in turmeric is curcumin, which was found to have antioxidant (Karami *et al*, 2011) and antibacterial activities (Negi *et al*, 1999). Furthermore, Soni, 1997 proved the protective effect of turmeric as feed additives on aflatoxin induced mutagenecity and hepatocarcinogenicity. Anti-inflammatory and immune system modulating effects of turmeric have been investigated (Lokesh *et al*, 1997). Turmeric also has antioxidant, turmeric extracts can scavenge free radicals, increase antioxidant enzymes, and inhibit lipid peroxidation. Curcumin, demethoxycurcumin, 5'-methoxycurcumin, and dihydrocurcumin, was found in Curcuminoids to be natural antioxidants (Selvam *et al*, 1995). Turmeric is used as an herbal medicine for rheumatoid arthritis, chronic anterior uveitis, conjunctivitis, skin cancer, small pox, chicken pox, wound

healing, urinary tract infections, and liver ailments (Dixit *et al*, 1988). Turmeric was documented as treatment for various types of respiratory conditions such as asthma, bronchial hyperactivity, and allergy, as well as for liver disorders, anorexia, rheumatism, diabetic wounds, runny nose, cough, and sinusitis (Araújo *et al*, 2001). Besides these properties, turmeric has strong antimicrobial properties. The growth of histamine-producing bacteria *(Vibrio parahaemolyticus, Bacillus cereus, Pseudomonas aeruginosa*, and *Proteus mirabilis)* was inhibited by garlic and turmeric extracts at a 5% concentration (Paramasivam *et al*, 2007). Ethanolic extracts of *C. longa* have good antifungal activity against *Trichophyton longifusus* (Khattak *et al*, 2005)

2.3 Daun Kesum (*Persicaria odorata*)

The species of *Persicaria,* is made up to about 150 different species with cosmopolitan distribution in Southeast Asia. The decoction or boiling down the crushed leaves or the plant itself of many species of *Persicaria*, including *P. barbata* and, *P. odorata* and *P. chinensis,* are used for the treatment of skin diseases such as scabies, ring-worms, boils, and ulcers (Wilson, 1990); and also used for the treatment of fresh wounds, snake bites, dog bites and insect bites due to the disinfection property of the plants (Nguyen *et al*, 1993). *Persicaria chinensis* alone, is therefore considered, traditionally for the treatment of eye infection, cholera, dysentery and headache (Do, 2001). *Persicaria odorata* is used as vegetable for cooking or mixed into salads. It has a pungent taste and therefore used as a spice , but also reported to have some medicinal importance especially as antioxidant agent (Vimala *et al*, 1999). Some populace of the regions utilize its leaves to be used in folk medicine to treat various ailments; the leaves have generally been controlled to treat the following: indigestion, stomach associated wounds and fungal infections. Its volatile aromatic components are utilized as flavor and fragnance agents (Vimala *et al*, 2003) and hence, its leaves are used worldwide in medicine, cuisines, pharmacy and cosmetics. Generally, the medicinal value of a drug plant is due to the presence of some bioactive chemical substances that produce a definitive physiological action on the body. The most important of these substances include aldehydes, alcohols, alkaloids, compounds of carbon, hydrogen, nitrogen, and many more. Some of these substances are poisonous so that the preparation and administration of the drug are left in the hands of skilful pharmacists and physicians (Giessman, 1963).

2.4 Bawang Dayak (*Eleutherine palmifolia* Merr.)

Bawang Dayak (*Eleutherine palmifolia* L. Merr.) was traditionally used the plant to cure various type of illness such as high blood pressure, diabetes mellitus, cholesterol, and ulcers (Kuntorini, 2010) by Dayak tribe. Kalimantan Island in Indonesia, despite there is no scientific reports on its anti-diabetic activity both *in-vitro* or *in-vivo.* The origin of Eleutherine plant is from South America. Others species from this genus for examples are *E. americana*, *E. bulbosa*, *E. plicata* and *E. latifolia*. They are cultivated and naturalized in Africa, Malaysia, Indonesia (Kalimantan and West Java) and the Philippines (Luzon, Leyte, Negros, Mindanao) (Mabrur, 2014). The plant has a good adaptation capability to grow on various types of climate and soil. It was reported antibacterial activity of EP ethanolic extract against several pathogenic bacteria (Subramaniam *et al*, 2012). Dayak onion *(Eleutherine palmifolia* Merr.) is one of the specific medicinal plants in Central Kalimantan that is used as a source of biopharmaceutical and is cultivated in order to not extinct from its natural habitat in the forest (Galingging, 2009). Dayak onion crop comes from division Spermatophyta, sub division Angiosperms, class, Monocotyledoneae order Liliales, family Iridaceae, genus *Eleutherine* and species *Eleutherine palmitoleic* Merr. (Megawati, 2005). Empirically, Dayak onion has been used by the local people (generation to generation) as a cure for various kinds of diseases such as breast cancer, colon cancer, high blood pressure (hypertension), diabetes (diabetes mellitus), ulcers, high cholesterol levels, andstroke (Galingging, 2009). The bioactive compounds of Dayakonion consist of *alkaloids, glycosides, flavonoids, phenolics, saponins, triterpenoids, and tannins* (Saptowalyono, 2007).

2.5 Previous Application of Different Type of Herbs in Feeding Programs for Laying Hens.

An increasing number of commercial phytogenic feed additives are available in the market. The majority of these additives are based on mixtures of plant extracts. Dosages may vary greatly depending on the raw materials used. Generally, the use of highly-concentrated extracts (e.g. essential oils) allows for low inclusion levels, whereas less concentrated materials (e.g. whole, dried plants) are added to the diets at a higher level. In order to guarantee a continuous quality of these products, strict standardization of active ingredients is mandatory. This is not always easy since the levels of active principles in plants or plant extract may vary considerably. Choosing the most suitable combination of ingredients requires extensive research, hence implementing broad *in vitro* testing as well as sophisticated feeding experiments under standardized conditions. Phytogenic feed additives may be applied either in the feed or in the drinking water, depending on the technical possibilities. Addition of powdered or granulated phytogenic feed additives in mash or crumbled layer diets allows for accurate inclusion levels and usually guarantees a steady supply of the active principles in the feed. On the other hand, application of liquid phytogenic formulas in the drinking water has the advantage of high flexibility in terms of application time and dosage. Provided that suitable dosing equipment is available on the farm, the liquid additive may be applied either continually or specifically at times of enhanced stress, e.g. feed change, housing or vaccination (Windisch, 2008). Similarly to other species, a direct comparison among studies is difficult due to the use of herbs preparations which differed in terms of their composition, physical form, content of active principles and dosages. Moreover, experimental conditions, as well as genetics and age of the birds may markedly affect the results observed in the various trials. The preparations used in these experiments included intact herbs, ground plant material, parts of plants and essential oils, with inclusion levels ranging between 0.02 and 1% of finished feed (Windisch, 2008). There are report inclusions of *Curcuma longa* that influence the egg laying production. Examples include 0.5% inclusion influence significantly the egg production percentage. There are not significant difference in egg weight and feed intake. However, 0.5% inclusion significantly affects the feed conversion ratio (Radwan *et al.*, 2008). 1.0% *Curcuma longa* inclusion does not significantly influence the egg production percentage. There are no significant difference in egg weight and feed intake. However, 1.0% inclusion also significantly affects the feed conversion ratio (Radwan *et al.*, 2008).

CHAPTER 3

METHODOLOGY

3.1 Study Site

This study was conducted at the Intensive Poultry Research Unit, Faculty of Sustainable Agriculture (FSA), University Malaysia Sabah, Sandakan, Malaysia.

3.2 Birds and Their Management

A total of 120 layers day old chick (D.O.C) of Bovans Brown were purchased at local hatchery, wing banded, individual weighed and reared in an open house system until 18 weeks of age. The birds were fed ad libitum with layer commercial diet and free access to drinking water. At 27 weeks of age, 96 birds was selected and randomly assigned to dietary treatment groups in individual battery cages. Then, treatment was randomly assigned to each dietary treatment in Complete Randomized Design (CRD), 4 treatments x 6 replicates x 4 birds. Dietary treatments were as follow:

T1 = Basal Diet (BD) containing no supplement (control)
T2 = Basal Diet + 1% Turmeric (TR)
T3 = Basal Diet + 1% Daun Kesum (DK)
T4 = Basal Diet + 1% Bawang Dayak (BWD)

The diet was prepared isonitrogenous and isocalori to meet the Nutrient Requirement of Council (NRC, 1994) and was offered in mash form.

Table 3.1 Composition of experimental laying hen diets

Ingredients (%)	Control (0%)	Turmeric (1%)	Daun Kesum (1%)	Bawang Dayak (1%)
Yellow corn	58.20	58.20	58.20	58.20
Soybean meal	24.10	24.10	24.10	24.10
Wheat	3.80	2.80	2.80	2.80
Crude Palm Oil	1.55	1.55	1.55	1.55
L-lysine	0.06	0.06	0.06	0.06
DL-methionine	0.16	0.16	0.16	0.16
MDCP	2.50	2.50	2.50	2.50
Limestone	8.00	8.00	8.00	8.00
Common salt	0.50	0.50	0.50	0.50
Vitamin premix	0.07	0.07	0.07	0.07
Mineral premix	0.06	0.06	0.06	0.06
Choline Chloride	1.00	1.00	1.00	1.00
Treatment	-	1.00	1.00	1.00
Total	100	100	100	100

3.3 Treatment Source

Fresh Turmeric, Daun Kesum, and Bawang Dayak were purchased from a local Sabah market. Next, Turmeric, Daun Kesum, and Bawang Dayak was mixed with the bird diets according to the experimental design. Each bird was housed in each battery cages and all birds were reared using wood shavings as litter. Access to feed and water was provided on an *ad libitum* basis.

3.3.1 Preparation of Herbs

The first herbs supplement was Turmeric is used in this study. The Turmeric was chopped, and processed by drying in oven for 48 - 72 hours in 65°C. Then, dried Turmeric grinded and sieved with 2mm sieve. The Turmeric powder then stored in plastic bag until further use. Next, the second herbs supplement was leaves part of Daun Kesum is used in this study. The leave was plucked. The Daun Kesum leaves was processed by drying in oven for 48 – 72 hours in 65°C. Then, dried Daun Kesum leaves grinded and sieved with 2mm sieve. The Daun Kesum powder then stored in plastic bag until further use. Finally, the third herbs supplement used in this study was Bawang Dayak was chopped, and processed by drying in oven for 48 – 72 hours in 65°C.. Then, dried Bawang Dayak grinded and sieved with 2mm sieve. The Bawang Dayak powder then stored in plastic bag until further use for formulating feeds.

3.4 Laboratory Analysis

3.4.1 Proximate Analysis

The proximate analyses was included in this experiment was applied firstly to materials to be used in formulating a diet as a protein and to finished feedstuffs, as a control to check that they meet the specifications or requirements established during formulation. The contents of moisture, dry matter, ash, crude fiber, crude protein, ether extract and nitrogen free extract were analysed according to the methods of Association of Official Analytical Chemists (AOAC, 1984).

3.4.1.1 Dry Matter

Approximately 5 g (W1) of each sample T1, T2, T3 and T4 were weighed and placed into a 50 ml pre-weighed porcelain crucible (W2). Then, the crucibles containing the sample (W3) were placed in an oven at a temperature of 65±1°C for 24 hours. After 24 hours, the crucibles were taken out from the oven, cooled at room temperature for 15 minutes, placed in a desiccator more than 15 minutes and weighed (W4). The dry matter was determined according to the calculation below:

$$\text{Dry Matter (\%)} = \frac{\text{Sample dry weight (g)}}{\text{Sample wet weight (g)}} \times 100$$

3.4.1.2 Moisture

After the percentage of dry matter calculated, moisture was obtained by minus dry matter with 100% according to the calculation below:

$$\text{Moisture content (\%)} = 100 - \text{Dry Matter (\%)}$$

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