

# Application of cinnamon and gotu kola supplements for increasing quail hematological status (Coturnixcoturnix-australiana)

*by* Sunarno Sunarno

---

**Submission date:** 24-Jun-2020 03:15PM (UTC+0700)

**Submission ID:** 1348962830

**File name:** n\_of\_cinnamon\_and\_gotu\_kola\_supplements\_for\_increasing\_quail.pdf (568.77K)

**Word count:** 4731

**Character count:** 24863

PAPER • OPEN ACCESS

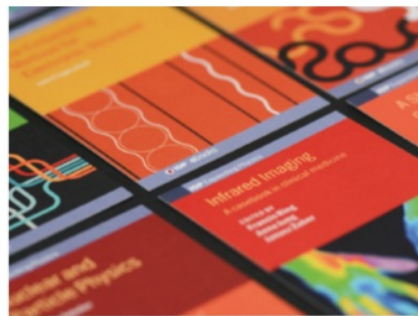
2

## Application of cinnamon and gotu kola supplements for increasing quail hematological status (*Coturnixcoturnix-australiana*)

To cite this article: S M Mas'adah *et al* 2019 *J. Phys.: Conf. Ser.* **1217** 012163

1

View the [article online](#) for updates and enhancements.



2

## Application of cinnamon and gotu kola supplements for increasing quail hematological status (*Coturnixcoturnix-australiana*)

S M Mas'adah<sup>1</sup>, Sunarno<sup>1</sup>, M A Djaelani<sup>1</sup>

<sup>1</sup>Laboratory Structure and Function Animal Biology, Department of Biology, Faculty of Science and Mathematics, Diponegoro University, Semarang, Indonesia

E-mail: [sunzen07@gmail.com](mailto:sunzen07@gmail.com)

### 1. Introduction

Quail is a poultry group that is widely cultivated by local farmers in Indonesia. The population of this type of poultry continues to increase from year to year. Quail population in 2010 reached 7.054 million head, increased in 2011 to 7.357 million head and finally to 7.841 million head in 2012 [1, 2]. It was further stated that in 2013 the quail population had reached 12,552,974, in 2014 it was 12,692,213, in 2015 was 12,903,759. As the community's animal protein needs continue to increase, the presence of quail populations not only sustains products in the form of consumption eggs but also meat products [3]. In this regard, efforts need to be made to increase quail populations by paying attention to aspects of health and



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

Published under licence by IOP Publishing Ltd

increasing productivity. A healthy and productive quail can produce quality eggs and meet the needs so that it can support the quality of life and community life. The condition of healthy quail cultivation maintenance management, quail population density in an ideal cage, and efforts to minimize various kinds of stress factors can support the success of quail cultivation

Healthy and productive quail can be seen from the indicators of body weight and hematological status, which includes hemoglobin and erythrocyte levels. Some of these variables have a correlation with the level of feed consumption, environmental stress, or nutrient composition contained in feed. Body weight and hematological status that are not ideal can cause inefficiency of energy use by livestock so that there is not enough energy available to increase productivity. The means to improve health status and quail productivity can be done by adding supplements in feed. Feed supplement is an additional essential feed ingredient that functions to stimulate growth, prevent disease, and increase productivity. The nutrients contained in feed supplements include amino acids, vitamins, minerals, antioxidants, and various other components that can improve digestive function and improve metabolism [2].

Research on the use of feed supplement ingredients to improve hematological status and productivity has been widely reported. Napirah *et al.* (2013) reported that giving 1% of turmeric flour feed supplements in feed significantly affected the improvement of broiler quail health quality as indicated by an increase in immunomodulatory activity and hematological status [4]. Tana and Saraswati (2015) reported that the administration of turmeric flour (*Curcuma domestica* Vallet) in feeds with 54 and 108 mg/head/day for 60 days in quail mothers could increase body weight and hematological status (erythrocytes and hemoglobin) in male F1 and female [5]. Turmeric has an active ingredient which is curcumin which is known to increase endurance, reduce the percentage of neutrophils, and increase physiological status. Hilmi's research results (2015) stated, the administration of piperine from black pepper (*Piper nigrum*) at a dose of 15-45 mg/kg BW can improve the hematological status of female quails. Various research evidence provides important information that plant biological resources contain antioxidants, namely active ingredients that have an important role in increasing immunomodulatory activity, physiological status, hematological status, health and productivity in aquaculture animals, especially quails. Types of plants that contain antioxidants and can be tried as a dietary supplement, including cinnamon (*Cinnamomumsp*) and gotu kola (*Centellaasiatica*).

Cinnamon is known by the scientific name *Cinnamomumsp*, which is one type of herbal plant that is known to have properties in boosting immunity and preventing disease. This type of plant has been used for generations by people in Indonesia, both as an addition to the taste of food or drink as well as traditional medicine [1]. All parts of this plant are used as herbal medicines, especially the bark. Shah and Panchal (2010) stated that the cinnamon bark contains a type of polyphenol antioxidant which has an important role in improving the health of the body, repairing tissue due to diseases and metabolic disorders, slowing down the function of organs due to increasing age, and increasing productivity [6]. Types of antioxidants contained in cinnamon bark, including polyphenols (90.1%), catechins (1.9%), quartetines (0.2%), kaempferol (0.02%), isorhamnetin (0.103%). Polyphenols in cinnamon function to make effective metabolic processes that are important in supporting hematological status and productivity. This type of antioxidant has been known to be involved in increasing protein synthesis which plays a role in increasing cell biomass, growth, hematological status of cultivated animals, especially broiler and quail chickens [7, 8].

Gotu kola known by the scientific name *C. asiatica* already known by the community as an herbal plant that has many benefits. Empirical experience has proven that this type of plant contains many active ingredients that function to increase immunity and health. Pitella *et al.* (2009) stated that *C. asiatica* leaf extract can improve hematological status, physiological status, and health of quail and hamster test animals [9]. This type of plant contains various kinds of antioxidants needed by the body. This plant contains many kinds of active compounds, including asiaticoside, asiatic acid, madecassoside, madecassic acid and brahmoside. *C. asiatica* is also known to contain various kinds of essential oils, such as citronellal, linalool, neral, menthol and linalil acetate. The group of compounds contained in

*Centella asiatica* include amino acids, flavonoids, terpenoids, and essential oils [7, 10]. These compounds function as antioxidants which are very beneficial for improving physiological status, hematology, health, and increasing productivity of quail.

Based on these problems, it is necessary to develop research by utilizing cinnamon and gotu kola to means improve physiological, hematological and health status which ultimately can increase quail productivity. This study used cinnamon and gotu kola as a feed supplement on laying quail. Furthermore, the influence of these two types of herbal plants on laying quails can be seen from the variables of body weight, hemoglobin levels, and erythrocytes.

## **2. Material and Methods**

### *2.1. Place and Time of Research*

The research has been carried out from September to October 2017 at the Laboratory of Biology of Animal Structure and Function, Department of Biology, Faculty of Science and Mathematics, Diponegoro University, Semarang, Central Java.

### *2.2. Research Subject*

Poultry that is used as the object of research is the female strain of Australian strain (*Coturnix coturnix australica*) taken from small farms in Sajen Village, Trucuk District, Klaten Regency. The number of quails used as test animals in the study was 24. This study consisted of 8 treatment groups with 3 replications. Quail maintenance consisted of a 7-day-old quail preparation period (taken from the farm location), acclimation for 7 days, and continued with the provision of feed supplements (cinnamon bark and gotu kola leaf) for 36 days.

### *2.3. Tools and Materials*

The tools used in the study included collective cages, acclimation cages, treatment cages, ovens, grinders, large trays, small trays, digital scales, Haemometer. The tools used in the study included collective cages, acclimation cages, treatment cages, ovens, grinders, trays large, small trays, digital scales, Haemometer Sahli, improved Neubaueuers, disposable plastic syringes, vacuntainer, ice flasks, sieves, cardboard sterophomes, beaker cups, stirring rods, masks, and nitrile gloves, thermometers and hygrometers. Materials for research include husks, 70% alcohol, aluminum foil, EDTA anticoagulants (*Ethylene Diamine Tetra Acetic Acid*), disinfectants, rodalon, and label paper. Sahli, improved Neubaueuer, disposable plastic syringes, counter, ice flask, sieve, sterofom cardboard, beker glass, stirring rod, mask, and nitrile gloves, thermometers and hygrometers.

### *2.4. Research Procedure*

This study start with the preparation and drying of test materials. Cinnamon bark and gotu kola leaves were obtained from the Semarang region. The next hold is making flour from cinnamon bark and gotu kola leaves. Separately the two ingredients were cut into pieces about 3 cm, washed, drained, and dried directly in the sun for 72 hours or dried using an oven at 60°C for 30-36 hours until dry matter was obtained with a moisture content of 10 %. Drying of the material serves to evaporate water and reduce levels of toxic compounds. Separately, the two types of material that have been dried are then put into the grinder, ground to obtain flour, then stored in a plastic box and ready for use.

Mixing supplements into feed is done separately and in combination by adding flour from both types of ingredients into standard quail feed with the specified percentage. Feed that has been mixed with supplements is then stirred until homogeneous, then put into the feed. The supplementary feed is given ad libitum every morning at 7:00 and afternoon at 16.00.

The next stage is the quail acclimation that will be treated. Quail (*Coturnix coturnix australica*) used has 42 days of age (mature genitals). Acclimation to quail is carried out for 7 days in individual cages and



during acclimation quails eating and drinking are given *ad libitum*. During acclimation, health maintenance is carried out, such as routine checks, addition of vitamins and vaccination

After finishing the acclimation, and then quail is the treated. Cinnamon and gotu kola supplements are given when quail is 15 days old for 36 days. Separately or a combination of supplements from the two types of ingredients is given in the following manner, successive controls (quail which is only given standard feed without supplements of cinnamon and gotu kola), supplements of cinnamon with levels of 5% or 10% mixed into in feed, supplements of gotu kola with levels of 5% and 10% mixed into feed, supplements of a combination of cinnamon and gotu kola with successive ratios (5%: 5%, 5%: 10% and 10%: 5%) . Supplement levels in feed are made referring to the results of research conducted by Sunarno (2018). During the study, daily temperature and humidity were measured. At the end of the treatment weighing quail body weight was carried out. Blood sampling was carried out from brachial vein on the left wing with a disposable plastic syringes  $\pm 3$  ml for determine of hemoglobin levels and the number of erythrocytes. Blood is put into acounter containing EDTA anticoagulants (*Ethylene Diamine Tetra Acetic Acid*), then stored in an ice flask. The sample was then analyzed to determine the hemoglobin level and the number of erythrocytes. Measurement of research variables is as follows, namely for hemoglobin levels obtained by using the Hemasin Acid method using Haemometer Sahli. The number of erythrocytes was obtained using the conventional manual method using a Improved Neubauer counting chamber.

### 2.5. Data Analysis and Interpretation

Data in the form of quail body weight, hemoglobin level, and the number of erythrocytes were tested for their distribution pattern and homogenous and continued with Analysis of Variance (ANOVA) test followed by Duncan Multi Range Test (DMRT), each with a 95% confidence level.

## 3. Results and Discussion

The results of the average analysis body weight, hemoglobin level, and number of erythrocytes in female quails after treatment can be seen in Table 1.

**Table 1.** Variable avarage value of body weight, hemoglobin levels, and erythrocytes after treatment

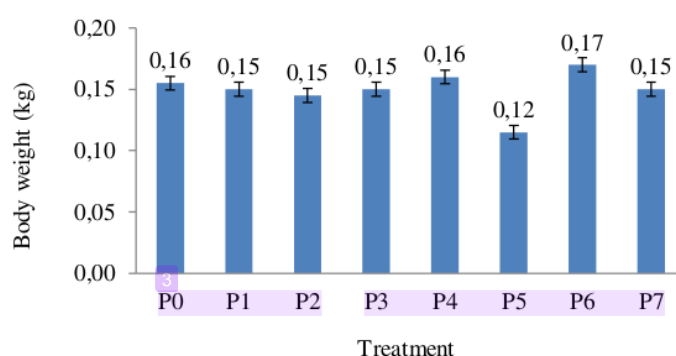
Parameter	Cinnamon and gotu kola supplements (%)							
	P0	P1	P2	P3	P4	P5	P6	P7
Body weight (kg)	0.16 <sup>a</sup> $\pm$ 0.01	0.15 <sup>a</sup> $\pm$ 0.01	0.15 <sup>a</sup> $\pm$ 0.02	0.15 <sup>a</sup> $\pm$ 0.01	0.16 <sup>a</sup> $\pm$ 0.01	0.12 <sup>c</sup> $\pm$ 0.04	0.17 <sup>b</sup> $\pm$ 0.01	0.15 <sup>a</sup> $\pm$ 0.01
Hemoglobin levels	11 <sup>d</sup> $\pm$ 7.1	11.5 <sup>d</sup> $\pm$ 9.2	4.3 <sup>a</sup> $\pm$ 0.4	8 <sup>c</sup> $\pm$ 1.4	5.1 <sup>b</sup> $\pm$ 1.4	8.8 <sup>c</sup> $\pm$ 0.8	13 <sup>e</sup> $\pm$ 2.8	6.5 <sup>b</sup> $\pm$ 0.7
Amount of erythrocytes	1.393 <sup>a</sup> $\pm$ 24.7	1.405 <sup>a</sup> $\pm$ 11.3	1.255 <sup>a</sup> $\pm$ 297	1.208 <sup>a</sup> $\pm$ 329	1.670 <sup>b</sup> $\pm$ 226	2.588 <sup>d</sup> $\pm$ 11	2.310 <sup>d</sup> $\pm$ 173	1.905 <sup>a</sup> $\pm$ 227

Description: A number followed by a different superscript in the same row shows a significant difference ( $P < 0.05$ ). P0, P1, P2, P3, P4, P5, P6, and P7 are the control treatments without supplements (0%), cinnamon supplements 5%, 10%, gotu kola supplements 5%, 10%, cinnamon combination supplements: gotukola (5%:5%; 5%:10%, and 10%:5%).

The results of variance analysis with a significance of 5% showed that dietary supplements significantly affected female body weight of quail ( $P < 0.05$ ). Sequentially the quail body weight on P7, P6, P5, P4, P3, P2, P1, and control was 0.15; 0.17; 0.12; 0.16; 0.15; 0.15; 0.15 and 0.16 kg. Based on the results of the Duncan test with a significance of 5% and observations of all treatments, it can be stated that P6 is a combination of cinnamon-gotu kola with a ratio of 5%: 10% shows the most significant effect on quail body weight, which is 0.17 kg, higher and significantly different from body weight at P1, P2, P3, P5, and P7. However, quail body weight in P6 was not significantly different from control and P4. The lowest quail body weight was found in P5 treatment which was 0.12 kg (Figure 1). High quail body weight due to supplementation is evidence that cinnamon and gotu kola when given in combination function more effectively in improving metabolic processes. Effective metabolic processes can stimulate growth,

increase cell biomass, and productivity. Sunarno and Djaelani (2018) stated, polyphenol compounds in cinnamon such as routine, catechins, quatzetin, kaempferol, oleoresin, and isorhamnetinare involved in increasing protein synthesis in the body.

Increased protein availability (enzymatic or non-enzymatic) affects the metabolic process more efficiently so that it can increase the growth and productivity of quails. The active compound in gotu kola also gives a real influence on the body weight of quails. The results of the study have shown that the compounds asiaticoside, asiatic acid, madecassoside, madecassic acid, brahmoside, citronellal, linalool, neral, menthol and linalil acetate, amino acids, flavonoids, terpenoids can increase levels of neurotransmitters, such as dopamine, norepinephrine, epinephrine and serotonin which function guarantee the availability of energy needed to increase cell or tissue biomass. Increased cell biomass or tissue will cause quail body weight to increase [1].

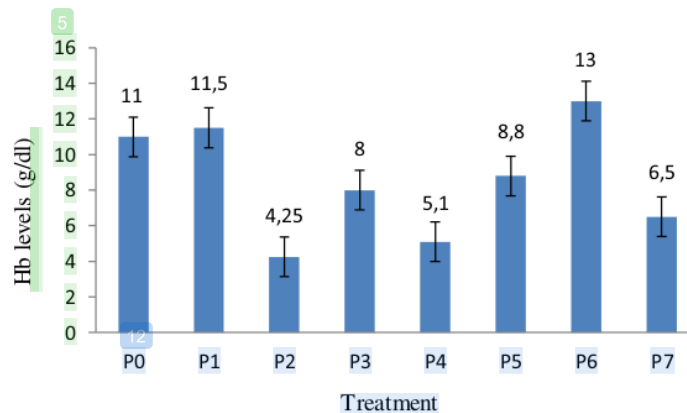


**Figure 1.** Quail body weight after treatment of cinnamon and gotu kola supplements

P0: control (quail given standard food without supplementation of cinnamon bark and gotu kola leaves), P1: feed supplemented with cinnamon bark powder 5%, P2: feed supplemented with cinnamon bark powder 10%, P3: feed supplemented with gotu kola powder 5%, P4: feed supplemented with gotu kola powder 10%, P5: feed supplemented with cinnamon bark and gotu kola powder (5%:5%), P6: feed supplemented with cinnamon bark and gotu kola powder (5%:10%), P7: feed supplemented with cinnamon bark and gotu kola powder (10%:5%).

The opposite result is shown in P5 treatment, namely quail has the lowest body weight. Low body weight is associated with a decrease in cell biomass (growth) and or is caused by active ingredients in narcotic gotu kola. Ingredients with narcotic properties if there are excessive amounts can trigger hypoxia. This condition if it occurs prolonged can trigger oxidative stress which has an impact on increasing the production of free radicals and the chain of free radical reactions. This reactive compound will attack randomly and not selectively against all organic matter in the body's cells, causing a disturbance in the metabolic process and a decrease in energy availability. The low energy produced by the metabolic process results in a decrease in quail body weight [11]. In addition, the low body weight of quail was thought to be related to the inhibition of cholesterol, fatty acid and triglyceride absorption in the digestive tract. Active compounds in cinnamon and *Centella asiatica* can form complex compounds during processing with other compounds in the digestive tract. As a result, the absorption of the digestive process becomes low, the circulation of raw materials becomes reduced and the metabolic substrate decreases. The low availability of metabolic substrates results in a decrease in energy production which causes the weight of the quail body to decrease, as shown in the P5 treatment.

The results of variance analysis with a significance of 5% showed that dietary supplements significantly affected female quail hemoglobin levels ( $P < 0.05$ ). Sequential mean quail hemoglobin levels at P7, P6, P5, P4, P3, P2, P1, and controls were 11; 11.5; 4.3; 8; 5.1; 8.8; 13 and 6.5 g/dl. Hemoglobin is a simple protein, giving red color to erythrocytes, and functions in binding oxygen [12]. Piliang *et al.* (2009) stated that normal hemoglobin levels in quail blood were 10-13 g/dl. Based on these figures, quail hemoglobin levels in treatment P6, P1, and P0 are normal.



**Figure 2.** Hemoglobin levels after treatment of cinnamon and gotu kola supplements

P0: control (quail given standard food without supplementation of cinnamon bark and gotu kola leaves), P1: feed supplemented with cinnamon bark powder 5%, P2: feed supplemented with cinnamon bark powder 10%, P3: feed supplemented with gotu kola powder 5%, P4: feed supplemented with gotu kola powder 10%, P5: feed supplemented with cinnamon bark and gotu kola powder (5%:5%), P6: feed supplemented with cinnamon bark and gotu kola powder (5%:10%), P7: feed supplemented with cinnamon bark and gotu kola powder (10%:5%).

Observations from all treatments showed that P6 (combination of cinnamon-gotu kola with a ratio of 5%: 10%) had the most significant effect on quail hemoglobin level with a number reaching 13 g/dl significantly different from treatment P0, P1, P2, P3, P4, P5, and P7. The lowest quail hemoglobin level was found in P2 treatment which was 4.3 g/dl (Table 1). This figure shows that quail hemoglobin level in P2 treatment is abnormal, as well as hemoglobin levels in the treatment of P3, P4, P5, and P7.

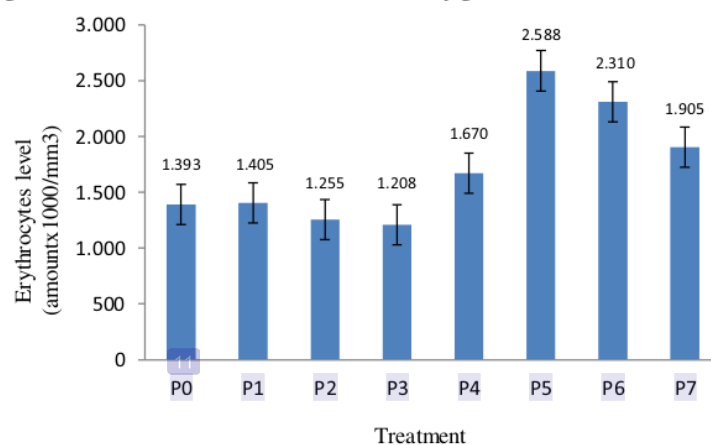
Based on the observed data shows that the high and low hemoglobin levels are related to various types of active compounds contained in supplement ingredients, both cinnamon and gotu kola. Supplements from both types of ingredients are known to contain phenolic compounds, flavonoids, and other types of antioxidants that play a role in maintaining cellular integrity and supporting the process of protein synthesis and metabolism [1]. Increased availability of protein (enzymatic or non-enzymatic) has an important role in hemoglobin synthesis [2]. Evidence from research also shows that active compounds in cinnamon and gotu kola can increase levels of neurotransmitters, such as dopamine, norepinephrine, epinephrine and serotonin. The availability of various kinds of neurotransmitters will affect the metabolic process running efficiently and effectively. The end of this process will produce energy in an optimal amount to support the process of hemoglobin synthesis. As a result hemoglobin levels will increase as evidence in this study. Piliang *et al.* (2009) stated that normal hemoglobin levels are an indicator of optimal availability of oxygen to support metabolic processes. Normally hemoglobin levels are also an indication of the availability of adequate levels of protein and amino acids. The low hemoglobin level as in P2 treatment (supplements of cinnamon 5% level) can be caused by various factors, one of which is the



availability of active compounds that are not optimal. This is evidenced by the higher hemoglobin level in P3 treatment (a supplement of 10% cinnamon). As a result, stimulation of protein synthesis will experience a slowdown followed by cellular metabolic processes that are less efficient and effective. The end of this condition is that the availability of energy is not optimal, followed by the low increase in cell and tissue biomass which in turn has an impact on lower quail body weight.

Data on hemoglobin levels such as in P7 treatment differed from P3 and P6 where supplements from the combination of cinnamon and gotu kola with levels (10%: 5%) affected the decrease in hemoglobin levels. The hemoglobin level drops to a lower level of 6.5 g/dl. This condition is thought to be related to the presence of toxic compounds and differences in osmotic pressure. Napirah *et al.* (2013) stated that toxic compounds and differences in osmotic pressure can interfere with the process of hemoglobin synthesis which results in low and abnormal hemoglobin levels as in P7. Hilmi (2015) states, hemoglobin is an indicator of oxygen availability in the blood. Hemoglobin functions as an oxygen carrier for body tissues, and carries carbon dioxide from the tissues to the lungs to be removed from the body [13]. Low hemoglobin levels, such as in P7, mean that the availability of oxygen in the blood for quail body tissue needs is not fulfilled. Besides that the presence of carbon dioxide that cannot be released effectively will also interfere with the metabolic process which results in a decrease in quail body weight. The same thing happened in several treatments, such as in P2, P3, P4, and P5.

The results of variance analysis with a significance of 5% on the variable number of erythrocytes showed that dietary supplements significantly affected the number of female quail erythrocytes ( $P < 0.05$ ). Sequentially the mean number of quail erythrocytes at P7, P5, P4, P3, P2, P1, and control was 1,393; 1,405; 1,255; 1,208; 1,670; 2,588; 2,310 and 1,905 million/mm<sup>3</sup>. Based on these figures, the number of quail erythrocytes in P5 and P6 treatments was not significantly different and higher and significantly different than other treatments and controls. Observations from all treatments showed that P5 and P6 (combination of cinnamon-gotu kola with a ratio of 5%:5% and 5%:10%) had the most significant effect on the number of quail erythrocytes with a number reaching 2.588 million/mm<sup>3</sup> and 2.310 million/mm<sup>3</sup>. The number of quail erythrocytes with the lowest number is found in treatments P1, P2, and P3, respectively 1.405; 1.255, and 1.208 588 million/mm<sup>3</sup> and not significantly different from the control (Figure 3). The average number of red blood cells in poultry is 1.25 - 4.50 million/mm<sup>3</sup>. The supplementation of cinnamon and/or gotu kola in this study was classified as safe, because the number of erythrocytes obtained was included in the normal range. The total amount of erythrocytes is influenced by an increase in age and mass of blood cells and is influenced by gender and environmental factors [14].



**Figure 3.** Amount of erythrocytes after treatment of cinnamon and gotu kola supplements

P0: control (quail given standard food without supplementation of cinnamon bark and gotu kola leaves), P1: feed supplemented with cinnamon bark powder 5%, P2: feed supplemented with cinnamon bark powder 10%, P3: feed supplemented with gotu kola powder 5%, P4: feed supplemented with gotu kola powder 10%, P5: feed supplemented with cinnamon bark and gotu kola powder (5%:5%), P6: feed supplemented with cinnamon bark and gotu kola powder (5%:10%), P7: feed supplemented with cinnamon bark and gotu kola powder (10%:5%).

Data as shown in Figure 3 shows that a single supplement, either cinnamon or gotu kola with a level of 5% and or 10%, has not been effective in increasing the number of quail erythrocytes. Conversely, supplementation in combination is more effective in increasing the number of erythrocytes as shown in treatment P5 and P6. The number of erythrocytes in treatment P7 fall down at a lower level. A higher number of erythrocytes is an indicator of protein availability and amino acids needed in the formation of erythrocytes are optimally available so as to support the formation of erythrocytes effectively and efficiently [15]. Furthermore, the combination of cinnamon and gotu kola supplements in combination causes the availability of nutrients for quail and these nutrients have an important role for the formation of erythrocytes such as amino acids, iron and Cu. Piliang *et al.* (2009) stated that a higher number of erythrocytes is an indicator that quails lack protein and amino acids needed for the body's metabolic processes.

The results of this study provide important evidence that supplements of cinnamon and gotu kola if given alone or in combination, with levels as needed or still low give different effects on the number of quail erythrocytes. Data on low erythrocyte counts such as P1, P2, P3, and P4 and not significantly different from controls showed that supplements of cinnamon or gotu kola did not effectively affect the process of erythrocyte formation. The low number of erythrocytes is an indicator that the availability of oxygen for the body's metabolic processes is not as needed. In addition to the availability of oxygen that is not optimal, the low number of erythrocytes can also be caused by the low availability of proteins and amino acids that play a role in the process of erythrocyte formation. This condition eventually results in a low number of erythrocytes such as evidence in this study. Campbell and Ellis (2012) stated that a low number of erythrocytes can be an indication of anemic condition while a high number of erythrocytes is an indication of polycythemia. It was further reported that high and low numbers of erythrocytes were influenced by age, individual activity, nutrient content of feed, altitude, and ambient temperature.

The results of the study provided important information that the supplementation of cinnamon and/or gotu kola give a significant influence on the increase in quail blood haematological status. Hemoglobin and erythrocyte levels were better and higher in the combination treatment between cinnamon and gotu kola with a ratio of 5%:10% (P6). Hemoglobin levels and higher erythrocyte counts become indicators of the availability of oxygen, proteins, and amino acids that support metabolic processes and erythrocyte formation. Conversely, the provision of supplements of cinnamon or gotu kola either alone or in a non-optimal combination can potentially reduce the hematological status of quail blood. In connection with this data, the combination supplementation as in P6 treatment is highly recommended to be applied by farmers as an effort to increase hematological, physiological, health and productivity increase in quail.

#### 4. Conclusion

Combinationcinnamomum (*Cinnamomumsp*) and*Centellaasiatica* with a ratio of 5%: 10% can increase the hematological status of quails, so the supplement composition of the combination of cinnamon and gotu kola used to improve hematological status, physiological status, health status and improvement productivity of Australian quail laying strains.



# Application of cinnamon and gotu kola supplements for increasing quail hematological status (Coturnixcoturnix-australica)

## ORIGINALITY REPORT

5%

SIMILARITY INDEX

4%

INTERNET SOURCES

1%

PUBLICATIONS

3%

STUDENT PAPERS

## PRIMARY SOURCES

1

[www.repository.cam.ac.uk](http://www.repository.cam.ac.uk)

Internet Source

1%

2

[sinta3.ristekdikti.go.id](http://sinta3.ristekdikti.go.id)

Internet Source

1%

3

[lcd.cpgei.ct.utfpr.edu.br](http://lcd.cpgei.ct.utfpr.edu.br)

Internet Source

<1%

4

[journal.unnes.ac.id](http://journal.unnes.ac.id)

Internet Source

<1%

5

Submitted to Napier University

Student Paper

<1%

6

[j.ideasspread.org](http://j.ideasspread.org)

Internet Source

<1%

7

[ce-mebsa.fsm.undip.ac.id](http://ce-mebsa.fsm.undip.ac.id)

Internet Source

<1%

8

Submitted to Jawaharlal Nehru Technological University

Student Paper

<1%

---

9	<a href="https://patents.google.com">patents.google.com</a> Internet Source	<1 %
---	--	------

---

10	<a href="https://www.mdpi.com">www.mdpi.com</a> Internet Source	<1 %
----	--	------

---

11	G. Fernandez-Escribano, P. Cuenca, L. Orozco-Barbosa, A. Garrido. "Computational Complexity Reduction of Intra-Frame Prediction in MPEG-2/H. 264 Video Transcoders", 2005 IEEE International Conference on Multimedia and Expo, 2005 Publication	<1 %
----	---	------

---

12	<a href="https://dspace.thapar.edu:8080">dspace.thapar.edu:8080</a> Internet Source	<1 %
----	--	------

---

---

Exclude quotes	Off
Exclude bibliography	Off

Exclude matches	Off
-----------------	-----



# Application of cinnamon and gotu kola supplements for increasing quail hematological status (Coturnixcoturnix-australica)

## GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10