# Effect of Garlic (*Allium sativum*) Supplementation on Leukocytes, Neutrophils and Lymphocytes Profile in Quail

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Garlic (*Allium sativum*) contains the bioactive component which is diallyl sulphide in the form of oxidized allicin which has the function to stimulate immune system (immunomodulator). Moreover, garlic has some components namely, alkaloids, saponin and tannin. Those components have a role as an antibacterial that can increase the number of leukocytes, neutrophils and lymphocytes. The aim of this research was to determine the effect of garlic supplementation on leukocytes, neutrophils and lymphocytes profiles in quail (*Coturnix coturnix japonica*).

This research used 60 quails, age 6 weeks. The method of research using Completely Randomized Design with 4 treatments and repeated 5 times. The treatments are garlic supplementation 0 g(P0), 0.7 g (P1), 1.4 g (P2) and 2.1 g (P3). After 30 days, the total number of leukocytes, neutrophils and lymphocytes was analyzed. The total number of leukocytes, neutrophils, and lymphocytes in quail blood increases because allicin contained in garlic stimulates some interleukins that can increase proliferation, maturation, and kemotaksis. The results showed that garlic supplementation containing 0.7 g, 1.4 g and 2.1 g can increase the number of leukocytes and neutrophils but have no effect on the number of lymphocytes The hignest number . of leukocytes is suplemented garlic 0.7 g , and for neutrophils. is 2,1 g

Keywords: garlic, leukocytes, neutrophils, lymphocytes, quails

# INTRODUCTION

Garlic (*Allium sativum*) is a herbal plant that can be used as a drug because its function is one of the immune system so that it could affect on livestock performance. There are two bioactive components of garlic; S-allylcysteine sulfoxide (allin) and diallyl disulfide-oxide(allicin). Alliin is an odorless precursor of alllicin which is resulted from catalyzing alliinase or allin lyase, and the product is responsible for a characteristic smell of garlic (Yeh and Liu, 2001). Moreover, garlic has some components i.e. proteins, minerals, vitamins, and lipids (Barnes et al., 2002). Fresh garlic contains vitamins, i.e. ascorbic acid 30 mg/100 g and vitamin E 9,4 μg/g, the minerals is selenium 0.014 mg/100 g and chromium 0.05 mg/100 g, also contain saponins, alkaloids, and tanin (Nagpurkar ,et al., 1998; Martha and Mia., 2004).

Garlic can improve the permeabilitas of cell membrane, which increases reaction intra antimicrobial against aerobic and anaerobic pathogens microbial. Studies on animal indicated that garlic (*Allium sativum)* has widely been used and reported to have increased in immunity, including increase the synthesis lymphocytes and release cytokines (Kyo et al., 1998). Garlic stimulates the immune system and improve the function of the digestive system in poultry. (Sumiyoshi, 1997 and Demir, et al, 2005).Performance of livestock can be reviewed from the health status , one indicators will include profiles of neutrophils and lymphocytes, which is an important part of the body's defense system against foreign things and microorganisms. When the value of neutrophils and lymphocytes decrease and low activity, it will result in damage the cells and tissues so that immunity will decline

Quail ( *Coturnix coturnix japonica* ) was the poultries meat and eggs, are potentially developed in commercial . In laboratory experiments , quail elected cxpcrimcntal animals bccausc its rcsponsivc animal .In 41 days agc, ablc to produce 250 - 300 eggs. per year ( Hartono 2004 ) . Using garlic as feed additive on quail can affect performans quail viewed from profile neutrophils and lymphocytes . Neutrophils normal in quail is 11,89 - 52,80 % while lymphocytes is 11,50.

## MATERIALS AND METHODS

The experiment was arranged as a completely randomized design using 60 laying quails (*Coturnix coturnix japonica*). with 4 kinds of treatment levels of garlic. Each treatments was repeated 5 times The treatments were : 1) R0: control (without treatment) 2) R1: 0.7 g garlic 3) R2: 1.4 g garlic ) R3: 2,1 g garlic.

Nutrient composition of rations consisted of 19.6%, crude protein , 3,83% crude fat, 4,67 crude fiber, and energy metabolism 2750 kcal/kg.( Livestock Nutrition of ruminants laboratory Animal Husbandry Faculty, Padjadjaran University, 2010 ). The experiment was conducted for a month, . Blood is taken from the left or right wing vein at the end of experiment .

The independent Observed : the number of Leukocytes, Neutrophils and limphocyte.

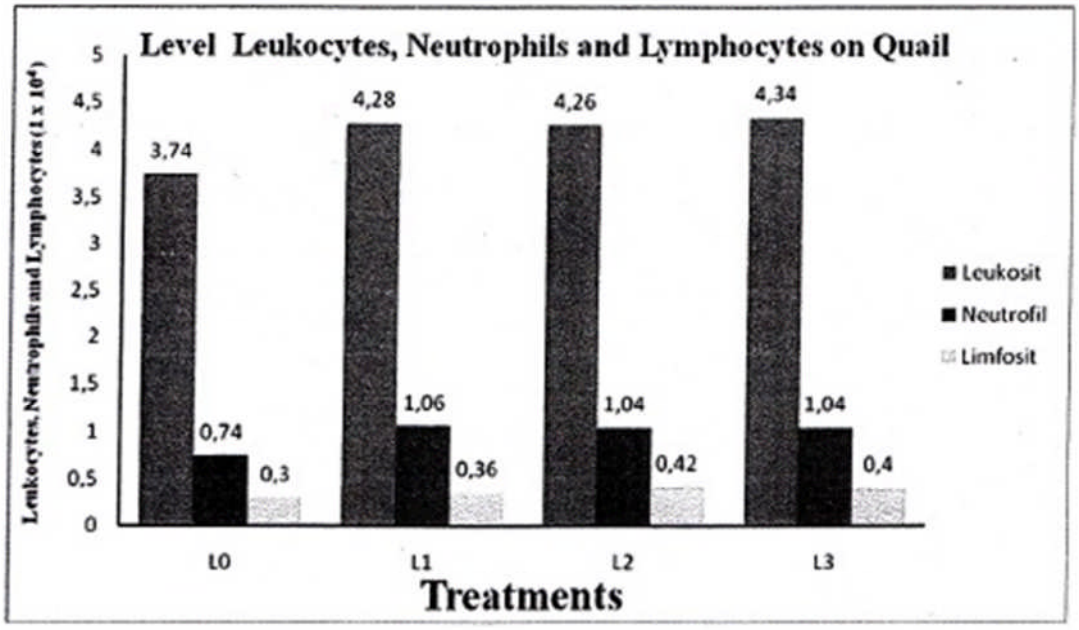
## RESULTS AND DISCUSSION

The influence of the treatments on the number of Leukocytes, Neutrophils and Lymphocytes, in quail showed in Table 1.

Table 1. Level Leukocytes, Neutrophils, dan Limpocytes on Quail

| Parameters | Treatment | | | |
|---|---|---|---|---|
| | R0 | R1 | R2 | R3 |
| | $10^4/mm^3$ | | | |
| Leukocytes | $3,74^a$ | $4,28^b$ | $4,26^b$ | $4,34^b$ |
| Neutrophils | $0.74^a$ | $1.06^b$ | 1.04b | 1.04b |
| Limpocytes | $0.30^a$ | $0.36^a$ | $0.42^a$ | $0.4^a$ |

Mean values within the same column with different superscript differ significantly (P<0,05).
$R_0$ : Control
$R_1$ : 0,7 g Garlic DM
$R_2$ : 1,4 g Garlic DM
$R_3$ : 2,1 g Garlic DM




**Ilustration 1. Level Leukocytes, Neutrophils dan Limphocytes**

Table 1., Showed that all the treatments R1, R2, and R3 with fed dietary garlic was significantly higher than those fed control. The numbers of leukocytes on the normal Quail between 1.6 – 2.5 x 104/mm3 . The number leucocyte in this research is 3.74 x 104/mm3, this value is higher than the normal leukocytes range

and R3,but still in the normal category health. Increasing the number of neutrophils are also due to the presence of antioxidants which prevents the occurrence of oxidation process on neutrophils i.e. selenium, Vitamin C and Vitamin E. Selenium improve cell membrane due to enzyme glutation peroxidases (GPX) 4 that prevents cell damage with catalyze peroxide to water and oxygen in the cell membrane (Arthur et al., 2003). Vitamin E broke the chain of free radicals in the cell membranes and lipoprotein, and produce tokoferoksil that are unreactive (Murray et al., 2003). Tokoferoksil will reduce by vitamin C into tocopherol, which helps protect cell membranes from peroksidasi (May, 1999).

Content of tanin and alkaloids in extract of garlic is antibacterial can help work neutrophils in fagositosis bacteria. Tanin has spasmolitik properties i.e. bacterial cell membranes furrow thus interfere with bacterial cell permeability which resulted cell cannot perform its growth stunted living activities so that even the dead. In addition tanin worked as an antibacterial can precipitate protein through reaction in cell membrane, enzyme inactivation, and destruction or inactivation function of genetic material bacterial cell (Masduki, 1996). Although Lymphocytes number is under the normal range, but given the garlic tends increase the number of lymphocytes. The growing number of lymphocytes caused by the presence of allicin which is the active substances of garlic through increased production of Interleukin 2 as to stimulate the proliferation of T-lymphocytes and mature ,and will repair the immune system increases the amount of lymphocytes (Tang et al., 1997). Electron as well as reduce returns tokoferoksil which is a compound that is not reactive free radicals results from solving the chain the death of bacteria (Robinson, 1998).

There are some factors affecting on leukocytes fed garlic that allicin contained in garlic significantly increase the metabolism of interleukin which increase the proliferation, differentiation ,maturasion lymphocytes and natural killer cell (Janet, 2006). Interleukins are small proteins that act as mediators inflammatory and immune regulator, hematopoesis produced by leukocytes, react with other leukocytes that can increase the number of leukocytes (Keiss et al, 2003).

Vitamin E in garlic as antioxidant and anti infeksion . Effect vitamin E as mediator by changes molecules receptor cell membranes lymphocytes and also may lower factors suppressor immunity ( immunosuppressive factors ) like hydrogen peroxide by activating macrophages ,eventually increase the number of leukocytes( Pallast et al., 1999 ) . The functions of alkaloid , saponin and tannin as antibacterial , also increase the number leucocytes. Alkaloid and saponin from garlic is capable of inhibiting the growth of bacteria, can make bacterial cells become lysis (Harborne, 1996) Tanin will interfere absorption of proteins by inhibits protease

. Neutrophils in all treatment significantly increase compared to control Factors affecting on neutrophils is allicin contained in garlic can stimulates IL-8 (Interleukin 8) working in neutrophils for enhanced kemotaksis process i.e. the process of phagocytes to the site of infection movement in response to various factors such as bacteria (May, 1999). Destruction of germs occurs in several phases: kemotaksis, adhesion, introduction and binding, ingestion , phagocytosis, culling, and digestion (Bratawidjaja 2006).

. The number of neutrophils is equal to normal on quail 11,89% u2013 52.80% (Piliang, et al, 2009). The number of neutrophils in R0 lower than R1, R2

## CONCLUSIONS

Based on the results of the research it can be concluded that:

1. Quail fed diet containing 0.7 g, 1.4 g and 2.1 g garlic can increase the number of leukocytes and neutrophils but have no effect on the number of lymphocytes.
2. Quail fed diet containing 2.1 g is the highest number of leukocytes and 0.7 g is the highest number of neutrophils.

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