Egg Weight and Hen Day Production (HDP) Layer Commercial at High and Low Altitude

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Abstract. The research about “Egg weight and Hen Day Production (HDP) Layer Commercial at High and Low Altitude” was conducted at Bogor district (low altitude) and Majalengka district (high altitude). Location farms in Majalengka (altitude of about 1,200 meters above sea level; the average daily temperature: 15-22°C); Bogor (height of about 140 meters above sea level; the average daily temperature 22-31°C). This aims to determine the level of egg production (egg weight and Hen Day Production (HDP)). Data collection technique was purposive sampling. The data comes from eight cages in the high altitude and fifteen cage on low altitude. The observed data were analyzed descriptively and t test. The results showed that the high altitude environment (Majalengka) supports the achievement of the egg weight and Hen Day Production (HDP) optimal.

1. Introduction
Layer commercial have an important role for the needs of human animal protein with the main production goal of eggs. The level of quantity and quality of eggs produced affects the fulfillment of community demand. The quantity of eggs can be drawn from the weight of eggs and Hen Day Production produced during the production process. Livestock productivity is a function of genetic and environmental factors. Production potency is determined by genetic quality that can be shown optimally through the support of environmental factors according to the needs of layer commercial. Environment can be in the form of nutrients, management, and environmental temperature. Unlike nutrients and management, the environmental temperature is an environment factor that is difficult to control because it depends on nature. In general, layer commercial have easy stress characteristics.

Environmental temperature condition is related to altitude. High altitudes are closer to the sun, which means that they should be slightly warmer. Biologically, layer commercial have a comfort zone needed to create optimal production.

Livestock in highland areas where the ambient temperature is a comfortable gyration, the use of production elements is more efficient because physiological processes in the body are not disturbed. In contrast to lowland areas with temperatures higher than the comfortable temperature of laying hens, there is no point in being used for production in an effort to stabilize the disruption of physiological processes in the body. The height of the place will affect the efficiency of the use of inputs, it means that in this effort there needs to be an alternative to various conditions in the regions, both upland and
lowland. The effort aims to obtain more effective and efficient business in the use of inputs, so that the creation of output in the form of optimal egg production is created. Therefore, it is necessary to review the weight of eggs and Hen Day Production in order to find out how far the height of the place affects egg production.

The study was conducted in Majalengka district as a representative of the highlands and Bogor regency as representatives of the lowlands. Based on population data for the last five years, the location has a high population of laying hens. Based on the explanation above, it is important to conduct research on "Egg Weight and Hen Day Production (HDP) Layer Commercial at High and Low Altitude ".

2. Experimental and Method

2.1. Research Materials

The research material is data from layer commercial farms managed by the Majalengka regency farmers as representatives of the highlands and Bogor regency as lowland representatives. The selection of research locations is based on

(1) The high population of layer commercial.
(2) The height of the place from the level of sea’s surface and the varying ambient temperatures. Location of farms in Majalengka (altitude: around 1,200 meters above sea level; daily average temperature: 15-22 °C); Bogor (altitude: about 140 meters above sea level; daily average temperature 22-31 °C).
(3) Strains maintained by Isa Brown
(4) Maintenance management and chicken coops are relatively the same, so it is easier to take samples.

2.2. Research methods

The type of research used is descriptive research. The sample was established using the proportional stratified random sampling technique with consideration of location based on altitude, strain, and relatively similar management.

3. Result and Discussion

3.1 Egg Weight (g/butir)

Egg weight is calculated based on the average weight of eggs produced during a maintenance period. The average egg weight can be seen in Table 1.

| Location   | N    | Average | Minimal Value | Maximum value | Variation Coefficient |
|------------|------|---------|---------------|---------------|-----------------------|
| Highland   | 14,969 | 59,49   | 59,10         | 60,13         | 0,59                  |
| Lowland    | 77,575 | 58,14   | 55,60         | 60,54         | 2,59                  |

Note : \( N \) = Number of Individuals in Population

The average weight of eggs obtained from the highland is relatively higher (59.49 g/egg) compared to the average low-lying egg weight (58.14 g/egg). More clearly, the average egg weight per week in the high and low plains is shown in Figure 1. The data were tested by using the t test. Based on the results of the analysis of the t test, it shows that there is a difference between the weight of eggs in the highlands and low (\( T \) count> \( T \) table). The weight of chicken eggs on the heat stress conditions was lower than the control [1].
This condition occurs because the low consumption of rations in the lowlands can reduce the content of the hormones progesterone and estradiol. This situation is related to a decrease in the number of large follicles and ovarian weights in heat stress conditions and decreased ovarian function due to reduced blood flow to the ovaries [2]. Progesterone and estradiol concentrations increased after puberty in all treatment groups but showed low levels in the group of chickens that were restricted to their feed. Progesterone with estradiol is needed to induce hypothalamus and pituitary so that it can stimulate the secretion of Luteanising Hormone (LH). LH acts for ovulation, it works through the cardiovascular system and nervous system [3]. The important factors that affect egg size are proteins and amino acids in sufficient rations. This condition causes large eggs to decrease and cessation of egg production [4]. Egg production and egg weight decreased at high temperatures as a result of decreased feed consumption, while decreasing eggshell quality (cracking and shell strength) was generally a high temperature effect [5]. The low consumption of rations has an impact on reducing the intake of protein and amino acids absorbed by the chicken's body.

![Egg Weight Chart](image)

With regard to the strength of the shell as a high temperature effect, the research data shows that the thickness of eggshells produced in the highlands is thicker than that of lowland eggs. Each has an average thickness of 0.40 mm (highland) and 0.27 mm (lowland). Calcium is the most important nutrient in eggshell formation. The availability of calcium is obtained through dietary consumption, nevertheless it is very dependent on several factors (one of them is high environmental temperature) [6]. The ability of laying hens to produce eggs with good shell quality is largely dependent on calcium availability in rations and skeletal reserves [7]). The low quality of shellfish in lowland eggs is caused by important or hyperventilation. H$_2$O and CO$_2$ compounds are released excessively, causing the formation of bicarbonate (H$_2$CO$_3$) to decrease. Excessive important conditions will reduce the rate of reaction of carbonic acid formation (HCO$_3^-$). Carbonic acid (HCO$_3^-$) is an important compound for the formation of shells along with calcium (Ca) from the mucosa of rabbit gland cells to form eggshells (CaCO$_3$) [8]. The high environmental temperature affects the low consumption of feed. Hence, calcium intake is reduced and contributes directly to the low quality of shellfish [9].
3.2. Hen Day Production (HDP)

Chicken with high egg production is the goal of maintaining laying hens. The high egg production can be illustrated by the HDP value obtained. The higher the HDP value shows the better the egg production of a group of chickens. The average HDP value during the maintenance period can be seen in Table 2. The average HDP value obtained from the highlands is relatively higher (75.45%) compared to the average lowland HDP value (71.23%). Based on Table 2, it can be seen that the maximum value in the lowlands is greater (81.54%) compared to the highlands (81.38%). The difference between the two is 0.16%, relatively smaller when compared to the difference in the minimum value of 3.94%. Maximum production achieved in the highlands and lowlands is an illustration of the genetic capabilities of Isa Brown. That is, the Isa Brown strain was able to be developed in both regions. Moreover, the high difference in minimum values illustrates the opportunity for chicken production in the highlands to be greater than the lowlands. The average weekly HDP value is shown in Figure 2.

| Location  | N  | Average | Minimal Value | Maximum Value | Variation Coefficient |
|-----------|----|---------|---------------|---------------|-----------------------|
| Highland  | 14.969 | 75.45  | 69.91         | 81.38         | 5.11                  |
| Lowland   | 77.575 | 71.23  | 65.97         | 81.54         | 7.48                  |

Note: N = Number of Individuals in Population

The data is then tested using the t test. Based on the results of the t test analysis, it shows that there is a difference between the HDP values in the highlands and low ($T_{count} > T_{table}$). The high of egg production is in line with the high body heat. These conditions will be optimal if it is supported by ideal environmental temperatures. Therefore, it is clear that at high ambient temperatures poultry will reduce production to prevent overheating. This is closely related to feed consumption previously stated that to reduce the heat caused by heat increases is through a decrease in feed consumption. The next impact of low feed consumption is a decrease in egg production. The low production of commercial laying hens at high ambient temperatures is related to physiological mechanisms as a result of heat stress causing distortion between hormonal balance and ovarian activity [9].
Theoretically, the increase in temperature above the comfort zone for poultry will cause heat stress, so 3β-hidroksistreroid Dehydrogenase (3β-HSD) activity is lower in follicular granulosa cells to increase the steroidogenic rate. This means that the follicular operation in the ovary will take place more slowly. This phenomenon is one of the reasons and causes of the decline in the production of composite eggs of laying poultry versus heat stress [3]. High environmental temperatures have been identified to be one of the main stressors in poultry production [10]. In addition, most farmers cannot be able to access environmental control technology because of the relatively expensive cost [11].

4. Conclusion
Based on the research that has been carried out it can be concluded that high altitude (Majalengka) supported optimal achievement egg weight and Hen Day Production (HDP).

5. References
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Acknowledgment
The authors thank to the head of the West Java provincial livestock department, head of the Majalengka districts livestock department, head of the Bogor districts livestock department for the provision of the facilities to complete our research.