

THE EFFECT OF ASCORBIC ACID ON BODY WEIGHT LOSS OF BALI CATTLE DURING TRANSPORTATION

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Abstract

Transportation caused stress and had impact on the body weight loss of Bali cattle after arriving at the destination. Body weight loss due to the stress of transport can be suppressed and reduced by administration of ascorbic acid. The purpose of this study was to determine the dose of ascorbic acid how best to give effect to body weight loss of Bali cattle during transportation. The experiment used randomized block design (RBD) consisted of 4 treatment dose levels of ascorbic acid (0 mg/kg body weight, 50 mg/kg body weight, 100 mg/kg body weight and 150 mg/kg body weight) were repeated 6 times, it took 24 head of Bali cattle. The difference between the treatment effect was tested using the Dunnett test. The results showed ascorbic acid significantly ($P < 0.05$) reduced body weight of Bali cattle loss during transportation. Treatment with ascorbic acid dose of 100 mg/kg body weight gave the lowest loss of 4.083 kg (2.431%) at the time of transportation.

Keywords: ascorbic acid, body weight loss, Bali cattle, transportation

INTRODUCTION

Due to the geography of Indonesia is an archipelago, the Bali cattle shipments from NTT to other islands, particularly to the island of Java requires transportation by land or sea. In its delivery to the island of Java requires a relatively long travel time, because the first 8 hours of cattle transported by road from the city of Kupang heading to the Port, and for 53 hours transported by ship from the port to Surabaya. Transportation causes stress livestock and its impacts on energy depletion and dehydration or lack of body fluids that cause loss of body weight of cattle upon arrival at destination. In turn farmers at a disadvantage, because it is usually the buyer is only willing to pay to the merchant after the cattle gets to their destination.

Transportation causes cattle to lose weight between 3-11 percent for the 18-24 hours of long transportation (Knowles and Warris, 2000 cited by Suryadi, 2011). In the current condition of transportation facilities, loss of cattle body weight during transport to around 5.5 % in Java and outside Java, 10.5 % (Ilham and Yusdja, 2010). Travel for 12, 24, 48 and 96 hours caused loss of body weight 6, 8, 12 and 14 % (Wythes, 1982 cited by Suryadi, 2011).

The cattle that were transported 5-6 hours lost 2 to 6.3% of body weight before. Transportation 24 hours by road, live weight of cattle lost about 8% (Mayes et al., 1979, Lambooy and Hulsegge, 1988; Tarrant et al., 1992 cited by Suryadi et al., 2011).

The research conducted by Penu et al. (2008) to 218 heads of cattle was gained an average loss rate of body weight that was transported from NTT to Jakarta at 12.60% of the body weight when purchased from a breeder. The loss rate was still higher compared with the results of Ilham et al. (2004), who reported a loss rate of body weight of cattle delivered different islands from Jakarta to Mataram in 11-12%.

Each year approximately 60,000 sales occur selling with an average weight of 250 kg and the selling price per kg of live weight Rp. 15.000. The amount of Bali cattle loss were transported to the island of Java from Mataram could reach 11-12% (Penu et al., 2008) up to 1 head of cattle will loss of 27.5 kg or will suffer a loss of Rp . 412.500 per cattle, therefore, each year achieve fantastic losses amounting to Rp. 24.75 billion. Therefore, in an effort to reduce of losing transported cattle body weight can be done by providing useful feed additive that keep the immune system during transport, one of which is the administration of ascorbic acid.

Ascorbic acid has attracted the attention of scientists in recent years because of its ability to cope with stress (high environmental temperature, disease and transport) in various animal species. Ascorbic acid is a natural antioxidant that can specifically stimulate GABA (gamma amino butyric acid), a type of receptor that serves to modulate the communication between cells in the brain. Recent research has shown that GABA will cease to function in the brain when ascorbic acid is not available in the body or in the brain (Calero et al., 2011). Asala et al. (2010) showed a decrease of antioxidants in the body caused by stress. Ascorbic acid is a vitamin that gives potential antioxidant function for the body, relatively inexpensive and virtually no toxic effects and easily metabolized in the body.

At the time of stress due to transport livestock, the hormone cortisol is secreted into the blood vessels, thus generally giving effect to the excretion of urine and faeces. This leads to loss body weight in cattle during transport. However, the administration of ascorbic acid, which is the stress hormone cortisol can be inhibited by GABA, so that defecation and urination can be reduced. The positive emotional response from acidifying ascorbic acid will run through the body and is received by the brain stem, then transmitted to one of the major parts of the thalamus of the brain. Then, contact the thalamus hippocampus to secrete GABA which served as a control emotional response, and inhibits acetylcholine, serotonin and other neurotransmitters that produce cortisol secretion (Calero et al., 2011).

MATERIALS AND METHODS

The animals used in this study were 24 male Bali cattle with a range of 2-2.5 years of age. Before transported, cattle were grouped first for 1 week based on randomization.

The ascorbic acid was administered orally to Bali cattle before they were transported. The ascorbic acid in the form of white powder with the chemical formula $C_6H_8O_6$ or by systematic IUPAC is 2-oxo-L-threo-hexono-1, 4-lactone-2, 3-enediol. Before it was given to cattle, ascorbic acid dissolved in water (H_2O).

Livestock transported in an open truck capacity 2 units of 12 cows per unit and were placed randomly as grouping. Journey performed for 8 hours, starting at 08:00 am the day until around 16:00 pm.

The tools used in this study were: Digital scale with a capacity of 1 kg to 0.5 g precision scale to weigh the dose of ascorbic acid. The fruit scales electric capacity of 600 kg/0.2 kg. OCS-XZ-GGE. This tool was used for weighing animal observed.

The preparation before the transport was grouping cattle. Livestock grouped 1 (one) week prior to transport. Furthermore weighing cattle before transporting, conducted to determine the weight before transporting.

Ascorbic acid administration procedures in this study were:

- Before fed to livestock, ascorbic acid was weighed according to the first dose of body weight each cow;
- Ascorbic acid which has been weighed and then diluted with water to 20 ml;
- Ascorbic acid solution incorporated into the "Oral Bottle";
- Oral ascorbic acid administration to cattle made 45 minutes prior to the transport.

The transport path traversed was Politani Kupang – Merbaun - South Coast - Politani Kupang, with the distance of 250 km and a long time 8 hours. During the journey the cattle were not fed and watered.

Transporting procedures performed in this study were:

- Provision of ascorbic acid did before transporting;
- One truck transporting 12 head unit which consisted of each treatment as a group;
- After all the animals transported on trucks, then performed the journey for 8 hours. Time off only for 15 minutes at 12:00 to eat and drink drivers.

The collection and recording of data were done after 8 hours of transport was completed, and all the animals have been unloaded from the truck. The data collected in this period were body weight before, after transportation and body weight loss.

The parameters observed in this study were body weight (kg) and body weight loss (%).

The research conducted experiments using a randomized block design (RBD) with four treatments and replications of each treatment done 6 times. The treatment according to the dose of ascorbic acid of research results of Minka and Ayo (2010), namely:

R0 = Control

R1 = Ascorbic acid 50 mg/kg body weight

R2 = Ascorbic acid 100 mg/kg body weight

R3 = Ascorbic acid 150 mg/kg body weight

RESULTS AND DISCUSSIONS

The effect of ascorbic acid administration on the body weight loss of Bali cattle during transport can be seen in Table 1. From Table 1 it appears that the results of the study showed the presence of loss of body weight in each treatment after transporting, in line with the dose of ascorbic acid used. The loss was the highest body weight of 10.75 kg and was obtained at R0 treatment (control) and the lowest was 4.00 kg in R3 (dose 150 mg/kg body weight). The increasing doses of ascorbic acid were given, the lower loss percentages of body weight or body weight. The amount of weight percentages of each treatment to the control (R0) was equal to 49.6% at R1, R2 62.05% and at 64.29% in R3.

Table 1. Administration Effect of Ascorbic Acid on Average and Body Weight Loss

Doses	Analysis	Variables	
		Body Weight (kg)	
		Before Transport	After Transport
R0	Mean (kg)	201.42	190.67
	Std Deviation	30.92	24.78
	Changes		-10.75
	BB Loss (%)		5.34
R1	Mean (kg)	186.75	181.34
	Std Deviation	21.25	21.12
	Changes		-5.42
	% of R0 (%)		49.60
	BB Loss (%)		2.90
R2	Mean (kg)	167.92	163.83
	Std Deviation	33.44	31.89
	Changes		-4.08
	% of R0 (%)		62.05
	BB Loss (%)		2.43
R3	Mean (kg)	153.00	149.00
	Std Deviation	34.90	35.12
	Changes		-4.00
	% of R0 (%)		64.29
	BB Loss (%)		2.61
	Probability (P)		P<0.05

From this study, it can be proven, that the transportation was an activity that causes stress

on livestock, due to the increase in physical activity suddenly, which were generally the transport process in areas such as NTT done the traditional way and with minimal facilities, so usually cattle experienced coercion and restraint during transportation. The higher the stress the animal received the higher the production of free radicals that can lead to increase generation of free radicals and ROS (Reactive Oxygen Species) in the body (Adenkola and Come, 2010), but with the administration of ascorbic acid appears the preparation of a lower body weight or loss that occurs can be suppressed.

To determine the difference in the effect of ascorbic acid dose on cattle body weight loss during transport, performed statistical tests to test variability. Results of analysis of variance showed that the dose of ascorbic acid ($P<0.05$) reduced body weight loss cattle during transport. To find the difference between the treatment effect followed by Dunnett's test, and the results are presented in Table 2.

Table 2. Dunnett Test Results Rate Differences Between Body Weight Loss of Control and Treatment

The Difference with Control Treatment	Loss (kg)	Std. Error	Significance
R1-R0	5.3333	2.3497	0.094
R2-R0	6.6667	2.3497	0.032
R3-R0	6.7500	2.3497	0.030

Notes: * Indicates significant difference ($P<0.05$)

Different results of body weight loss on each treatment with the control in Table 2 above shows that the administration of ascorbic acid at a dose of 50 mg/kg body weight of cattle (R1) did not make a difference loss to the control treatment (R0), but the administration of ascorbic acid with a dose of 100 mg/kg body weight (R2) and 150 mg/kg body weight (R3) showed differences in different loss of body weight significantly ($P<0.05$) greater than control (R0). It means that a decrease in body weight or body weight loss R2 and R3 markedly lower than the control (R0).

The difference between the effect of treatment at doses of ascorbic acid low of 50 mg/kg body weight, yet showed the presence of excess body weight loss during transportation means. Difference in loss for new transport body weight were evident ($P<0.05$) in R₂ and R₃. The increasing doses, leads to changes and

differences in the loss of cattle body weight. The difference was due to the ability of ascorbic acid to stimulate amino butyric acid (GABA), which is located in the brain. GABA is one of the major inhibitory neurotransmitter of the central nervous system, serves to inhibit the release of the hormone cortisol as a cause of stress. The cortisol is released into the blood causing an increase in body homeostasis by means of defecation and urination so the cattle's body weight loss during transport. In line with the higher doses of ascorbic acid, the higher the ability amino butyric acid (GABA) stimulate to inhibit the release of cortisol into the blood. Thus the administration of ascorbic acid with the higher dose also more effective in reducing the release of the hormone cortisol, so the impact of body weight loss due to transportation can be reduced (Minka and Ayo, 2010). To clarify how the loss of body weight each treatment is shown in Figure 1. The illustration shows that the higher doses of ascorbic acid the lower the loss of cattle body weight during transport.

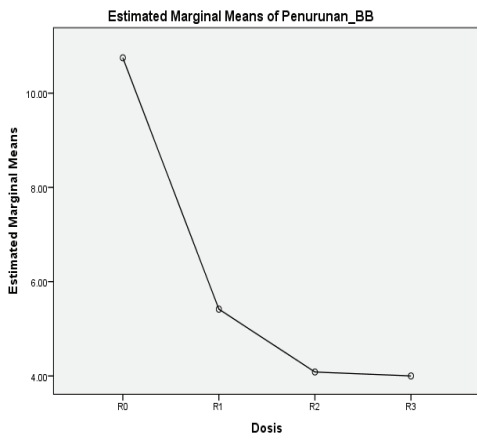


Figure 1. Graph of the effect of ascorbic acid on body weight loss

In normal conditions, the needs of ascorbic acid in ruminants have been met and no need for additional supplements. However, under stressful conditions, the status of ascorbic acid in the body becomes less (Ozimek and Kennelly, 2010). Therefore, the necessary conditions of stress livestock is the intake of ascorbic acid in order to meet the needs of the body against the effects of stress, so it appears

the role of ascorbic acid in reducing body weight loss due to transportation.

CONCLUSIONS

Based on the results of the discussion, the following conclusions can be drawn:

- Provision of ascorbic acid up to 150 mg/kg of body weight lowered loss weight of Bali cattle during transport;
- Provision of ascorbic acid at a dose of 100 mg/kg body weight gave the lowest loss of body weight in Bali cattle transport.

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