Physiological Responses, Blood Profile and Performance of Local Beef Cattle to Short Period of Road Transport

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ABSTRAK

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Transportasi dapat menimbulkan dampak negatif terhadap performa dan aspek kesejahteraan ternak. Penelitian ini bertujuan untuk menganalisis pengaruh transportasi jarak dekat pada sapi Peranakan Ongole (PO) dan Silangan Lokal (SL) terhadap respon fisiologis, profil darah dan performa selama rekondisi, Penelitian ini menggunakan 16 ekor sapi jantan berumur I_1 (18-24 bulan), yang tediri atas 8 ekor sapi PO dan 8 ekor sapi SL, dengan rataan bobot sapi PO dan SL adalah 289,8±27,2 dan 285,5±31,7 Kg. Peubah yang diamati yaitu susut bobot, suhu rektal, laju respirasi, *panting score*, kandungan glukosa, kreatinin, *packed cell volume* (PCV), haemoglobin (Hb), eritrosit, leukosit dan diferensiasi leukosit, serta peubah performa selama rekondisi meliputi konsumsi dan konversi pakan, pertambahan bobot badan (PBB) dan pertambahan bobot badan harian (PBBH). Data susut bobot, respon fisiologis dan profil darah dianalisis menggunakan analisis sidik ragam dengan pengukuran berulang. Selanjutnya data performa selama rekondisi dianalisi menggunakan analisis kovarian dengan bobot awal yaitu bobot pasca transportasi sebagai kovariabel. Hasil penelitian menunjukkan sapi PO dan SL mengalami stress selama transportasi jarak dekat. Kadar glukosa dan PCV sapi PO pre-transportasi nyata lebih tinggi (P<0,05) dibandingkan pada sapi SL. Selanjutnya kadar glukosa dan PCV sapi PO dan SL nyata lebih rendah pasca transportasi (P<0,05), meskipun tidak berbeda nyata antar bangsa. Selain itu rasio neutrophil:limfosit meningkat pasca transportasi jarak dekat ini. Lebih lanjut sapi PO memiliki performa yang lebih baik selama pemeliharaan rekondisi, Dimana bobot akhir pasca rekondisi, PBBH dan PBB, serta konsumsi pakan dan bahan kering ransum yang nyata lebih tinggi dibandingkan pada sapi SL (P<0,05).

Kata Kunci: Profil Darah, Respon Fisiologis, Sapi Lokal, Performa, Transportasi

ABSTRACT

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Transporting livestock poses a risk to animal performance and welfare. The objective of the study was to evaluate the impact of short transport periods on physiological responses, blood profile and performance during recondition period of local beef cattle. A total of 16 bulls consisting of eight Ongole Grade (PO) and local crossbred (SL) were used in this study. Parameters observed were weight loss, rectal temperature, respiratory rate, panting score, glucose, creatinine, packed cell volume/PCV, hemoglobin (Hb), erythrocyte, leucocyte, and leucocyte differentiation, as well as data for performance during recondition period namely feed consumption and conversion, average daily gain and final weight after reconditioning. Data for body weight loss, physiological parameters, and blood profile were analyzed with analysis of variance (ANOVA) with repeated measurement. Whereas data for performance during recondition was analyzed by analysis of covariance with initial weight post transportation as covariable. Results showed that PO cattle have significantly higher (P<0.05) glucose and PCV concentrations during pre-transportation than SL cattle due to the more excited character of PO cattle. Glucose and PCV of PO and SL cattle were significantly decreased (P<0.05) during post transportation. It might be that cattle were exhausted due to transport, change in energy utilization, and fluid balance changes during and after transport. However, the concentration of glucose and PCV were similar for both breeds during post transportation. In addition, short periods of road transport increase neutrophil: lymphocyte ratio. Furthermore, PO cattle have better performance during recondition period compared to SL cattle. Final weight, average daily gain, feed consumption and dry matter intake after 10 days of recondition for PO cattle was significantly higher (P<0.05) compared to SL cattle

Key Words: Blood Profile, Physiological Responses, Local Beef Cattle, Transportation

INTRODUCTION

Transportation is one of the key elements in the livestock logistics chain, where the mobilization of livestock occurs from producers to consumers (Miranda-de la Lama et al. 2014). Mainly for local beef cattle that majorly transported both short and long transport conditions. Short transport conditions are mainly done within the same region, usually within a single district or province (Saptana and Ilham 2018). Several local breed cattle which mainly transported were Ongole grade (PO) and Local crossbreed either Simmental-PO cross (SimPO) or Limousin-PO cross (LimPO). According to Cardoso et al. (2015a), cattle belong to *Bos indicus* has better adaptation to tropical conditions compared to *Bos taurus.* Therefore, crossbreeding between both species will have benefit impact for the offspring in adaptation to tropical conditions. Even though transportation is crucial, this process poses risks causing various negative impacts due to the many stressors that arise, such as microclimate and weather conditions, solar radiation intensity, vibration, mixing, as well as lack of feed and water. The negative impacts include weight loss (Coffey et al 2001), wounds, injuries, increased mortality (Malena et al. 2007; Minka and Ayo 2009a), and damage to carcasses and meat (Strappini et al. 2009), which result in high economic losses. Stress assessment during transportation can be observed through various indicators, including changes in physiological status and blood profiles (Avila-Jaime et al. 2021), and post-transportation performance (Coffey et al 2001).

A better understanding of cattle transportation in Indonesia, which has a tropical climate where high temperature and humidity represent major environmental stressors, is therefore essential to design mitigation programs to reduce the negative impacts caused. This study aims to evaluate the physiological status, blood profiles, and post-transportation performance of Ongole Crossbred (PO) and Local Crossbred (SL) cattle during short-distance transportation (short duration).

MATERIALS AND METHODS

Materials

A total of 16 bulls consisting of 8 bulls of PO and SL with average age was I_1 (18-24 months) were used for the trial. The average body weight of PO and SL bull were 289,8±27,2 kg and 285,5±31,7 kg respectively. the feeds during recondition periods were combination of commercial concentrate, forage and fermented feed (Sorinfer). Furthermore, the vehicle to transport the bulls was Mitsubishi Fuso Fighter 220 PS truck with floor space 19,25 m^2, which provide space allowance for the bulls 1,13 m^2. In addition, Data logger REED R6030 was used to record temperature and humidity real time during trial. 10 ml blood vacutainer, 10 ml syringe, medical alcohol 70% were used for blood sample preparation and digital thermometer was used for rectal temperature measurement.

Methods

The research was complied with ethical commission from The School of Veterinary Medicine and Biomedical Sciences (SKHB) IPB University. Cattle weighing, physiological parameters measurement, namely rectal temperature and respiratory rate as well blood sample collection was carried out a day before transportation in the evening with empty stomach condition. Whereas blood sample collection was carried out from *Vena Coccigea* using 10 ml of disposable syringe, then collected into *vacutainer* containing EDTA and put into cooler box for further measurement of glucose, creatinine, *packed cell volume* (PCV), hemoglobin (HB), erythrocyte, leukocyte dan leucocyte differentiation. On a day of transportation, the bulls were loaded into the truck with space allowance of 1.13 m^2/head and transported to beef cattle housing at Faculty of Animal Sciences, IPB University. In addition, data logger was adjusted into the truck to record temperature and humidity every hour.

The distance and duration of transport was approximately 102 km and 6 hours and 58 minutes, comprises of 4 hours and 23 minutes of travel (voyage) and a resting period of 2 hours and 12 minutes. During the resting period, the cattle were not provided with feed and drinking water. The average transportation speed during the journey was 23.2 km h^{-1}.The transportation was categorized into short transport duration according to (Nielsen et al. 2022). Road conditions during transportation varied from well-maintained asphalt roads to uneven surfaces. The journey was relatively smooth, with moderate traffic congestion at several points. Weather conditions were initially cloudy and overcast, while heavy rainfall occurred toward the end of the journey near the rearing facility.

Immediately after arriving at beef cattle housing facility cattle were unloaded, then the bulls were weighing to determine the weight loss (shrink), blood sample collected and measured for rectal and respiratory rate. The blood sample was analyzed at Laboratory of Meat, Draught and Sport Animal Nutrition, Faculty of Animal Sciences, IPB University. Immediately after transport, the bull fed with roughage, then after two hours they have access to clean water. Feeding trial was conducted on the previous day post transportation with different feed namely combination of commercial concentrate and forage with ratio 80:20 and Sorinfer (completed fermented feed based on sorghum and Indigofera plants), with daily feed requirement was 3% from body weight based on dry matter content. Feed was fed three times daily from 6-7 AM, 1-2 PM and 5-6 PM, with the ratio of feed given was 35:25:45. Feed intake was measured by subtracting the feed given and leftover. The bulls then reweigh after 10 days post transport to examine recovery weight.

Parameters observed

The parameters observed were weight loss, physiological responses namely rectal temperature and respiratory rate. Whereas blood profile was glucose, creatinine, packed cell volume (PCV), haemoglobin (HB), erythrocyte, leukocyte and leukocyte differentiation. Temperature and humidity were measured to calculate temperature humidity index (THI) to support stress examination of cattle during transportation (Table 1). In addition, performance production parameters of the bull were initial weight pre-transport (kg), average daily gain (ADG), final weight after reconditioning (kg), as feed consumption (kg/day), dry matter intake (kg/day), as feed conversion and as feed dry matter conversion. The formula to calculate THI was described below:

THI = 0.8Tab + RH (Tab – 14.4) + 46.4

THI = Temperature Humidity Index
Tab = Temperature (^{o}C)

RH = Relative Humidity (%)

The analyses for glucose and creatinine were conducted using commercial assay kits with catalogue numbers 112191 and 112192. The hematocrit value was determined using a microcapillary hematocrit reader (microhematocrit method). Haemoglobin concentration was determined by the Sahli method. Erythrocyte and leukocyte counts were analyzed using a Hemocytometer (Neubauer chamber. Then, Leukocyte differential counts were determined using the Giemsa staining method.

Data analysis

Data of weight loss, physiological responses and blood profile were analysed with repeated measurement analysis of variance. Whereas production performance was analyzed with analysis of covariant 2x2 factorial with initial weight pre-transportation as co-variable.

RESULTS AND DISCUSSION

Physiological responses and weight loss

Average value of THI during transportation was 80.3±5.6, and its categorized as mild stress for the cattle (Bulitta et al. 2015). According to (Barnes et al. 2004), cattle undergo heat stress will increase respiratory rate and rectal temperature. The result of the study shows that the respiratory rate and rectal temperature of the PO and SL pre transportation were similar as well as post transportation. However, respiratory rate of PO and SL cattle were significantly decreased (P<0,05) post transportation (Table 2). In addition, rectal temperature of PO and SL bull pre- and post-transport were in normal range. However, the respiratory rate of PO and SL bull pre transportation was out of normal range than post transportation according to Jackson and Cockroft (2002). Higher respiratory rate of PO and SL bull pre transportation indicated that both cattle were stressed during handling before transport. In the other hand, declining value of rectal temperature and respiratory rate post transportation might be caused by microclimate condition during transportation in which heavy rainfall occurring in the final stage of transportation. Rainfall can significantly reduce ambient temperature, thereby lowering the heat load experienced by the animals. Several studies have reported that under cooler environmental conditions caused by rainfall, cattle tend to reduce their respiration rate and core body temperature as part of physiological mechanisms to maintain homeostasis. In addition, the presence of water droplets on the skin and hair due to rain exposure may influence body heat exchange with the environment. The water layer on the body surface can alter heat dissipation processes through conduction and evaporation, contributing to changes in thermoregulatory responses. Similarly, water spraying on cattle is often applied as a management practice to alleviate heat stress under high temperature conditions (Brouk et al. 2003; Gaughan et al. 2005; Legrand et al. 2011; Brown-Brandl 2018).

Result shows that cattle breed has no significant effect on weight loss post transportation. The average body weight loss of PO and SL bull were 7,0±4,0 kg (2,5±1,5 %) and 9,3±5,3 kg (3,1±1,7 %) respectively (Tabel 1). It is indicated that PO and SL cattle has capabilities to adapt with environmental condition during short period of transport. Even though the weight loss were not significant between breeds, the SL cattle produce higher loss. It might be that SL more susceptible to heat stress compare to PO cattle. in tropical conditions zebu cattle which carry *Bos indicus* blood are relatively more susceptible to heat stress (Cardoso et al. 2015). therefore, PO cattle tha belongs to *Bos indicus* has lower weight loss, compare to SL cattle that containing *Bos taurus* genetic proportion.

Table 1. Table 1 Heat stress categories based on THI values

THI Value	Heat stress categories
≤ 74	Normal
75 – 78	Stress ringan
79 – 83	Stress sedang
≥ 84	Stress berat

Bulitta et al. (2015)

Table 2. Mean values of physiological responses parameters and body weight Loss of PO and SL bull pre- and post-transportation

Parameters	Cattle breeds	Measurement time		Standard value*
		Pre-transportation	Post-transportation	
Rectal temperature (°C)	PO	39.1±0.1	38.8±0.5	38.0–39.5
	SL	39.2±0.4	38.5±0.6	
Respiratory rate (breathe/minute)	PO	46.5±9.8^{a}	24.0±4.3^{b}	15-30
	SL	43.5±6.2 ^{a}	24.0±3.0^{b}	
Body weight (kg)	PO	289.8±27.2	283.0±29.9	
	SL	285.5±31.7	276.3.0±27.0	
Weight loss (kg)	PO	7.0±4.0		
	SL	9.3±5.3		
Weight loss (%)	PO	2.5±1.5		
	SL	3.1±1.7		

Different superscript ini similar coloum shows significant different (P<0.05) *)Jackson and Cockroft (2002)

Result study shows that PO bull has significantly (P<0.05) higher value of glucose and PCV than SL bull before transportation. Nevertheless. the average glucose and PCV value of both breeds were similar after transportation and the value was on normal range (Table 3). Increasing blood glucose levels on both PO and SL bull is closely related to stress responses induced during transportation. (Belhadj Slimen et al. 201), mentioned that in stressful situations, animal requirement of energy is highly relied on glucose as primary energy source. In addition, (Brunel et al. 2018) stated loading and unloading process during transportation were critical for animals. so that energy requirement will significantly increase. thus, blood glucose levels will increase.

Creatinine level was similar for PO and SL bulls pre- and post-transportation. even though the value was higher than standard (Table 3). This indicates that both PO and SL bulls were experienced muscle fatigue and dehydartion as response to stress induced by transportation, including handling process. Increasing level of creatinine induced by physical activity or exercise of cattle during loading and unloading. as well as standing activity of the cattle to maintain their balance during motion in the truck that causes muscle fatigue (Escalera-valente et al. 2021). Increasing concentration of PCV is strongly related to dehydration conditions of the cattle due to physical activity during handling and transportation, which exacerbated by thermal stress form the environment (Minka and Ayo 2009). In addition, Das et al. (2016) mentioned that increasing concentration of PCV is part of adaptation mechanisms of the body to compensate for water loss during the recovery process following dehydration due to evaporative fluid loss. Furthermore, *Bos indicus* cattle (Scheffler 2022), in this research represent by PO cattle have aggressive temperament than *Bos taurus* or *Bos taurus crossbred* (SL cattle). Therefore, PO bull has significantly higher glucose and PCV content pre-transport than SL bull.

Result shows that Hb concentration was increase post transportation for both breeds. The increasing concentration of Hb were similar among treatments both pre- and post transportation. however the values were above the standard (Weiss and Wardrop 2010) (Table 3). Furthermore. erytrocyte was decrease post transportation. eventhough the result were similiar both breeds pre- and post transportation (Table 3). Cattle that expose to stress and dehydration during transportation will lead to significant loss of body fluids (Brunel et al. 2018). In addition, the loss of body fluids occurs during respiration and through sweating (Barnes et al. 2004). Data analysis shows that leucosite consentration was increase post transportation. However the value was similar pre- and post transportation for both breeds and the value was in normal range (Weiss and Wardrop 2010). Change in leucosite concentration describes imune responses of the animal due to stress, physical activity and fear (Roland et al. 2014)., in this research stres was triggered by handling procedures and during transportation. Stress during handling and transportation will activate the hypothalamic–pituitary–adrenal (HPA) axis, resulting in increased secretion of catecholamines (adrenaline and noradrenaline) and cortisol. These hormones subsequently influence various physiological and hematological parameters, including erythrocyte concentration in the blood. In addition, variations in erythrocyte counts may be related to changes in body fluid balance. During transportation, animals may experience considerable fluid loss, leading to dehydration. However, after transportation, when cattle regain access to drinking water, plasma volume increases, which can dilute circulating erythrocytes and consequently reduce their concentration in the blood. This mechanism likely explains the decrease in erythrocyte concentration observed after transportation (Minka and Ayo 2009; Rakib et al. 2016; Alam et al. 2018a; Brunel et al. 2018). Furthermore, prolonged stress conditions can elevate cortisol secretion, which may influence erythropoiesis and the lifespan of erythrocytes in circulation (Maheshwari et al. 2013; Zulkifli et al. 2019; Jung et al. 2022).

Result shows that limfosit concentration was similar between breeds both pre-and post transportation. However limfosit concentration post-transportation for both breeds was significantly lower (P<0.05) compare to pre-transportation. Furthermore, limfosit concentration was higher than standard value (Table 4). These means that PO and SL bulls were stressed due to physical activity during handling before and after transportation. Stress during handling for tranportation will stimulate secretion of catecholamines and glucocorticoids from cortex adrenal and medulla. So that elevation of glucocorticoid can causes damage on limfosit in tymus cortex and prolongs neutrofil lifespan, ultimately lymphocyte depletion will enhance neutrophil concentration in blood (Ishizaki & Kariya 2010). In addition, elevation of neutrophils concentration in blood may result from a shift in leukocyte proportions due to lymphopenia, it is a common condition observed in animals under stress condition (Alam et al. 2018).

Monocytes concentration of PO bull pre-transportation was significantly higher (P<0.05) compare to SL bull. However monocytes concentration of both breeds were similar post-transportation, and the average value of monocytes for both breeds were above standar value (Table 4). Elevation of monocytes count in PO bulls may reflects stress reponses which associated with handling procedures, in which PO bull that belongs to *Bos indicus* has more excitable temperament compare to *Bos taurus* and their crossbreed (Scheffler 2022). In addition, Roland et al. (2014), mentioned that enhancement monocytes concentration on blood circulation closely related to accute stress and infection condition on the animal.

Eosinophil and basophil concentration were similar for PO and SL bulls both pre- and post-transportation. Even though the value was above the standard (Table 4). This indicates both cattle were stress during handling and transportation, however, no evidence the bull has health disorder or infectious diseases during transportation. Acute stress following transportation may induce alterations in leukocyte dynamics, including changes in eosinophil and basophil concentrations. Transportation is recognized as a major stressor in cattle production systems, triggering activation of the hypothalamic–pituitary–adrenal (HPA) axis and increased secretion of cortisol and catecholamines. These stress hormones can modulate immune function and influence the redistribution of leukocyte populations in the bloodstream. Several studies have reported that transportation stress may increase the total leukocyte count and certain leukocyte subpopulations, including eosinophils and other granulocytes, as part of the physiological stress response in cattle (Hong et al. 2019). The increase in eosinophils and basophils observed after transportation may also reflect inflammatory or immunological responses associated with tissue irritation, dehydration, and environmental challenges during transport. Transportation conditions such as heat stress, prolonged standing, and feed and water deprivation may stimulate inflammatory mediators that influence granulocyte mobilization into circulation. In addition, stress-induced endocrine responses can alter leukocyte trafficking between blood and tissues, resulting in temporary changes in leukocyte distribution during the post-transport recovery period (Avila-Jaime et al. 2021).

Results shows that neutrofil: lymphocyte ration were similar between pre- and post transportation among the breeds However, the bulls were indicated stressed during short period of transportation due to elevation of neutrofil: lymphocyte ratio (Table 4). Neutrofil: Lymphocyte ratio describes stress condition on the animal (Viswanathan & Dhabhar 2005). Furthermore, elevation of cortisol on the blood was followed by elevation neutrofil concentration and the destruction of limfosit. Therefore neutrofil: lmyphocyte ratio was increase (Kim et al. 2018).

However, during transportation over relatively short distances or durations, changes in the neutrophil-to-lymphocyte (N:L) ratio do not always show a significant increase. This condition may be influenced by the physiological adaptive capacity of the animal, environmental conditions during transportation, and management practices applied before and after the journey (Earley & O'riordan 2006; Minka & Ayo 2009; Maheshwari et al. 2013; Romero et al. 2014).

Data analysis shows that there was significant correlation (P<0.05) between glucose and PCV, Hb and creatinine, erytrocyte and creatinine respectively on pre-transportation condition (Table 5). These indicated that the bulls were already stressed due to handling procedures during transportation. Stress will stimulates

glycogensis, thereby blood glucose concentration will increase as part of adaptive physiological mechanism to supply energy during stress exposure (Tadich et al. 2013; Brunel et al. 2018). In addition, during stress exposure substantial body fluid losses will occur due to dehydration, and it will lead to reduction in blood plasma volume, while the erythrocyte concentration remains relatively constant. As a result,

Table 3. Mean values of leucosite differentiation of PO and SL bulls pre- and post-transportation

Blood parameters	Cattle breeds	Measurement time		Standard value*
		Pre-transportation	Post-transportation	
Glucose (mg/dl)	PO	51.504±3.889[b]	76.730±3.737[a]	45-75
	SL	39.963±3.287[c]	74.276±3.158[a]	
Creatinine (mg/dl)	PO	4.310±0.393	4.851±0.521	1.0-2.0
	SL	4.604±0.297	4.755±0.394	
PCV (%)	PO	10.629 ±0.461[a]	12.371±0.950[a]	21-30
	SL	9.000±0.498[b]	11.867±5.90[a]	
Hb (g%)	PO	28.429 ± 2.268	31.000±2.231	8.4-12
	SL	30.417±2.449	32.667±2.410	
Erytrocyte (10^6/ul)	PO	6.591±0.615	5.779±0.691	4.9-7.5
	SL	6.883±0.665	6.312 ± 0.747	
Leucosite (10^3/ul)	PO	5.936±0.645	6.893±0.691	5.1-13.3
	SL	6.400±0.696	7.250±0.746	

Different superscript ini similar coloum shows significant different (P<0.05) *)Weiss and Wardrop (2010)

Table 4. Mean values of leucosite differentiation of PO and SL bulls pre- and post-transportation

Leucosite differentiation	Cattle breeds	Measurement time		Standard value*
		Pre-transportation	Post-transportation	
Lymphocyte (%)	PO	60.414±3.647[b]	46.129±3.129[a]	1.8-8.1
	SL	59.145±3.939[b]	51.685±3.379[a]	
Neutrophil (%)	PO	30.457±3.757[b]	46.199±3.221[a]	1.7-6.0
	SL	33.310±4.058[b]	43.310±3.479[a]	
Monocytes (%)	PO	2.399±0.304[a]	1.370±0.274[a]	0.1-0.7
	SL	1.192±0.328 [b]	1.408±0.296[ab]	
Eosinophils (%)	PO	5.787±0.703	5.299±1.016	0.1-1.2
	SL	5.660±0.759	2.653±1.098	
Basophils (%)	PO	0.950±0.007	0.970±0.210	0-0.2
	SL	0.910±0.005	0.940±0.040	
Neutrophil: Lymphocyte (N:L)	PO	0.568±0.358	0.976±0.192	
	SL	0.548±0.218	0.932±0.544	

Different superscript ini similar coloum shows significant different (P<0.05). *Weiss and Wardrop (2010)

PCV and Hb concentration, and erythrocyte count will increase significantly (Avila-Jaime et al. 2021). Furthermore, very significant correlation (P<0.01) between erythrocyte and Hb were detected (Table 5). Hemoglobin concentrations will significantly increase during stress conditions. This mechanism was result from the release of adrenaline and epinephrine/norepinephrine, consequently it will induce the elevation of blood pressure thereby promoting the erythrocyte counts (Brunel et al. 2018a; Avila-Jaime et al. 2021).

Significant correlation (P<0.05) between leucocyte and Hb concentration, then very significant correlation (P<0.01) between erythrocyte and Hb concentration were detected post-transportation (Table 5). These phenomena may result from dehydration conditions of the bull during transportation, whereas excessive body fluids loss occurred during thermal stress. Thereby blood plasma concentration was reduced, yet red blood cell concentrations were relatively constant. Hemoglobin, a blood protein, serves as the primary constituent of erythrocytes (Avila-Jaime et al. 2021). In addition, increasing leukocyte concentration as part of the acute stress response, fear and physical exercise (Roland et al. 2014).

Data analysis shows that PO cattle have significantly higher body weight (P<0.05) after 10 days recondition than SL cattle. The result corresponds with higher (P<0.05) feed consumption, dry matter consumption and ADG of PO than SL cattle (Table 6). Stress during transportation will reduce voluntary feed consumption, therefore it will decrease performance during initial feedlot period (Marques et al. 2012). In addition, stress associated with transportation will alter the physiological status of livestock, which consequently impacts the control of feed intake (Gouvêa et al. 2022). Furthermore, increasing body weight post-transportation is mainly caused by a shift of a lower to higher energy diet during recondition period that facilitated compensatory growth to the animal (Meléndez et al. 2021).

Table 5 Pearson's correlation coefficient of blood profiles of PO and SL bulls pre- and post-transportation

Blood profiles	Glucose	Creatinine	PVC	Hb	Erytrocyte	Leucocyte
--- Pre-transportation ---						
Glucose	1.000	0.014	0.691*	-0.195	-0.149	-0.558
Creatinine	0.014	1.000	0.493	0.672*	0.671*	-0.065
PCV	0.691*	0.493	1.000	0.328	0.350	-0.265
Hb	-195	0.672*	0.328	1.000	0.870**	-0.017
Erytrocyte	-0.149	0.671*	0.350	0.870**	1.000	-0.228
Leucocyte	-0.558	-0.065	-0.265	-0.017	00.228	1.000
--- Post-transportation ---						
Glucose	1.000	0.245	-0.092	-0.103	-0.311	-0.177
Creatinine	0.245	1.000	0.395	0.520	0.275	0.091
PCV	-0.092	0.395	1.000	0.030	0.141	-0.225
HB	-0.103	0.520	0.030	1.000	0.805**	0.669*
Erytrocyte	-0.311	0.275	0.141	0.805**	1.000	0.448
Leucocyte	-0.177	0.091	-0.225	0.669*	0.448	1.000

**very significant correlation (P<0.01). *Significant correlation (P<0.05)

Table 6. Impact of breed on the mean value of performance parameters of local beef cattle fed with different concentrate feed (commercial concentrate and Sorinfer) within 10 days recondition

Performance	Cattle breeds	
	PO	SL
Initial weight pre-transportation (kg)	289.80±27.20	285.50±31.70
Weight post-transportation (kg)	283.00±29.90	276.30±27.00
Recondition weight after 10 days (kg)	298.80 ±2.12^{a}	291.60±2.27^{b}
ADG (kg/day)	1.668 ±0.212^{a}	0.948±0.227^{b}
Feed consumption (kg/day)	15.837 ±0.864^{a}	11.149±0.925^{b}
Dry matter consumption (kg/day)	5.320 ±0.373^{a}	3.726±0.399^{b}
Feed conversion	10.904 ±1.396	11.760±1.494
Dry matter conversion	3.633±0.356	3.984±0.381

Different superscrip in similar rows shows significant difference (P<0.05)

Better performance of PO than SL cattle during recondition after short period of transportation indicated that PO cattle are more adaptive to novel environmental conditions and concentrate feed. In addition, PO cattle that belong to *Bos indicus* exhibit greater tolerance to thermal stress. *Bos indicus* species is more tolerant of thermal stress compared to *Bos taurus* species. Therefore, *Bos indicus* species can maintain a higher feed intake under stress conditions, with a slower rate of feed intake reduction during stress compared to *Bos taurus* cattle (Hansen 2004; Pereira et al. 2014; Beatty et al 2004).

CONCLUSION

Short period of road transportation (< 8 hours) induces stress on PO and SL cattle. Indication of stress can be observed from body weight loss and change in blood metabolite sucah as increase in blood glucose, as well as increasing lmphocyte and decreasing of neutrofil post transportation. In addition, recovery for body weight of PO and SL cattle were achieved after 10 days post transportation. Furthermore, PO cattle has better performance during recondition period with higher body weight, ADG, feed consumptioan and dry matter consumption the SL cattle.

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