

The Effects of Oral Administration of Cashew Leaf Extract on Feed Intake and Concentration of Plasma Metabolites in Ulu Chicks

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ABSTRACT

The evidence to date suggests that cashew leaf extract (CLE) is well known for being a great source of bioactive substances that may be good for health in animals. However, its effects on plasma metabolites in ulu chicks have not yet been fully clarified. In this study, we therefore examined the effects of oral administration of CLE on feed intake and plasma metabolites including glucose (GLU), total cholesterol (CHO) (TCHO), triglyceride (TG), and glutamic oxaloacetic transaminase (GOT) in Ulu chicks. The Ulu chicks were orally administered with different doses (0, 3, 6 and 9 ml/kg body weight) of CLE to monitor its effects on feed intake, and plasma metabolites during 120 min of the experimental period. The results showed that oral administration of CLE did not change feed intake. However, oral administration of CLE significantly linearly decrease the plasma GLU, TG and TCHO in Ulu chicks. In conclusion, these results suggest that acute oral administration of CLE may have a potential role in decreasing plasma GLU, TG and TCHO but not alter GOT and feed intake.

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Authors' Contribution

The study design and experiment scheduling, data analysis and manuscript draft were contributed by EE, EI, and SZ, while manuscript revisions were done by EE, VSC, ME and JAP. All authors reviewed the analyzed data and gave their approval to the final draft of the manuscript.

Key words

Cashew leaf extract, feed intake, glucose, Ulu chicks

INTRODUCTION

The consumption of native chickens in East Asia and Europe has increased due to its flavor, although indigenous chicken meat is relatively costly (Yang and Jiang, 2005). Among various cross breed of indigenous

chickens spread in Indonesia, Ulu chickens is a famous one (Erwan *et al.*, 2024). This chicken is a cross breed between Pelung native males and Hubbard broiler females, combining traits and both indigenous and commercial broiler lines. However, it was reported that indigenous chicken meat has a moderately high concentration of meat cholesterol (CHO) which is about 116 mg per 100 g compared to the broiler which is about 110 mg per 100 g (Saidin, 1999). Although CHO has many functions for health and well-being, it also may have deleterious effect in body if its content is in abnormal level in blood. Importantly, the major risk resulting cardiovascular disease is of low-density lipoprotein (LDL) CHO (Stanciulescu *et al.*, 2023). In indigenous chicken production systems, feed constitutes the predominant component of production expenses, whereas reliance on imported constituents and

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synthetic additives persistently undermines economic efficiency and sustainability. As a result, the interest in native plant resources as functional feed components has markedly intensified. Dietary strategies, including the use of plant-based or herbal supplements, have been explored to reduce CHO levels in poultry meat (Pérez-Burillo *et al.*, 2020). One of potential herbs which is abundant in Indonesia is cashew (*Anacardium occidentale* L.). It was reported that cashew leaf extract (CLE) contains tannins, saponins, resins, alkaloids and flavonoids (Leitão *et al.*, 2013; Varghese *et al.*, 2013) which have pharmacological actions, such as anti-inflammatory, anti-cancer, antidiabetic, and antioxidant qualities (Wijayanti *et al.*, 2024).

It was reported that concentration of total cholesterol (TCHO) in the blood of poultry is associated with meat CHO concentrations, where a decrease in blood CHO content will be accompanied by a decrease in meat CHO (Mamonto, 1992). According to Olaniyan (2016) stated that cashew also contain fiber about 33.52% to 46.25% which able to decrease LDL CHO. In addition, fiber may reduce the absorption of CHO in bloodstream. Besides the antioxidative role of CLE, it has also potential role as a growth promotor. Setiawan *et al.* (2018) revealed that supplementation of CLE in ration increased height of villi, and components of digestive organs in Jawa super chickens. Consequently, CLE has the potential to serve dual roles as a physiological regulator and as a growth promotor.

Additionally, leave of cashew also have been reported to exhibit hypoglycemic properties (Ojewole, 2003). CLE has antibacterial and antioxidant properties, making it a safe and natural feed additive (Sinlapapanya *et al.*, 2022, 2024). However, there is no report on the immediate effects of CLE on feed intake and plasma metabolites including glucose (GLU), CHO, triglyceride (TG), and glutamate oxaloacetate transaminase (GOT) in Ulu chicks. Therefore, the aim of this study was to examine the effects of acute oral administration of CLE on feed intake, and plasma metabolites in Ulu chicks.

MATERIALS AND METHODS

Animals

A total of 40 one-day-old Ulu chicks were purchased from a breeder hatchery (Japfa Comfeed Indonesia Tbk, Pekanbaru Indonesia) then 20-25 birds were placed in a wire-meshed cage (50 x 35 x 33 cm) in a group at a constant temperature of $30 \pm 1^\circ\text{C}$ and with continuous light. Chicks were all of the same age and were housed without any adult. Commercial feed (metabolizable energy: >3,050 kcal/kg, protein: >23.5%: commercial

starter diet, 311-VIVO, Pokphand Tbk, Medan, Indonesia), and water were provided *ad libitum*. The composition of the diet is presented in Table I. Feed intake (at 30, 60 and 120 min) was determined by measuring the reduction in the amount of feed consumed from a pre-weighed feeder. The weight of the feeder was measured using an electric digital balance.

Table I. The percentage of nutrient content in commercial ration.

Nutrient	Commercial ration
Crude protein (%)	23.50
Crude fiber (%)	1.88
Crude fat (%)	5.87
Ca (%)	0.29
P (%)	0.15
ME (Kcal/kg)	3,050

Ca, Calcium; P, Phosphor; ME, Metabolizable Energy; *Commercial feed: CP511 PT, Charoen Pokphand, Indonesia; **Mineral Premix: Supplemented for kg of the diets: Vit. A, 12000 IU; D3, 2000 IU; E, 20 mg; K3, 3 mg; B2, 7 mg; B3, 12 mg; B5, 3 mg; B12, 0.03 mg; biotin, 0.1 mg; choline chloride, 300 mg; Mn, 130 mg; Fe, 70 mg; Zn, 60 mg; Cu, 12 mg; I, 1 mg; Se, 0.2 mg, and adequate antioxidant.

Preparation of CLE

The method for processing CLE was as follows: cashew leaves were washed with tap water then chopped into 1-2 cm size, after that weighed 500 g and mixed with 1 liter of water blended until it became smooth and filtered for getting CLE as described by Khothijah *et al.* (2021).

Experimental design

One day before the experiment, chicks (6 days old) were reared individually and assigned for treatment and control groups on the basis of their body weight in order to produce uniform group. The number of animals use in each group were kept to 10 chicks. On the day of the experiment, each chick (7 days old) was orally administered with 0, 3, 6 and 9 ml/kg body weight of CLE by the elastic plastic needle on small syringe. The dose of D-Asp for i.c.v. was based on the findings of our previous report. The birds were fed diets *ad libitum* during the experimental period of 2 h. Feed intake were examined at 30, 60 and 120 min by measuring the reduction in the amount of feed consumed from a pre-weighed feeder. The weight of the feeders was measured using an electric digital balance (Altraman Company, Indonesia). At the end of the experiments, birds were decapitated following the AVMA 2020 Guidelines. Blood samples were collected in heparinized tubes and centrifuged for 15 min at $5,000 \times g$. After that plasma were

collected and kept at -20°C until analyses were conducted.

Plasma biochemical parameters measurement

The plasma metabolites including GLU, CHO, GOT and TG were measured by Microlab 300 (Vital Scientific, Netherland). The samples were assayed together and in a random sequence for each metabolite at State Islamic University of Sultan Syarif Kasim Riau.

Statistical analysis

Feed intake and plasma metabolites were statistically analyzed by one-way analysis of variance (ANOVA) and regression equations using the commercially available package StatView (Version 5, SAS Institute, Cary, USA, 1998), Tukey test was done as a post hoc test when interactions were significant. Significant differences were denoted as $P < 0.05$. Data were presented as means $\pm$ S.E.M. All raw data in each group were analyzed to a Thompson rejection test to eliminate outliers ($P < 0.01$), and the remaining data were used for the analysis among groups.

RESULTS AND DISCUSSION

Figure 1 shows the effects of oral administration of several doses of on feed intake. Oral administration of CLE did not significantly alter feed intake in chicks ($F[3, 33] = 2.88, P > 0.05$). This result was consistent with the previous reports by Khothijah *et al.* (2021), who revealed that no significant effect was found by the supplementation of CLE on feed intake in broiler chickens. In addition, Setiawan *et al.* (2018) revealed that supplementation of guava leaf flour at the level 2.5 g to 10 g/kg ration did not alter feed intake and body weight gain of Jawa super chickens. It was reported that guava leaf has similar bioactive compounds to cashew leaf including flavonoid, polifenol and tannin (Indriani, 2006; Kim *et al.*, 2011). In the light of information mentioned above and of the results from the present study, it might be suggested that acute administration of CLE seems to have no adverse effects on feed intake in Ulu chicks.

Figure 2 shows the effects of oral administration of several doses of CLE on GLU, GT and GOT, while Figure 3 shows correlationship of CLE with TCHO and GLU. A significant ($P < 0.01$) negative correlation between the doses of CLE and the plasma concentration of GLU was detected ($358.5 [SE = 21] -10,84 [SE = 3.66]X, R^2 = 0.189$) and significant effect ($F[3, 35] = 10.2, p < 0.0001$) was found between different treatments in terms of GLU. These findings are consistent with an earlier report that the administration of extract of cashew leaves significantly decreased glucose levels in rats (Samalia *et al.*, 2025) and in addition, Jaiswal *et al.* (2016) reported that injection of

ethanol extract of cashew tree leaves decreased blood GLU levels at 8.01% and 19.25% in the fasting rats on day 15 and 30 days, respectively. Tedong *et al.* (2010) concluded that hydroethanolic extract of cashew seed extract (CSE) may be a potential anti-diabetic nutraceutical. Moreover, Olaniyan (2016) revealed that CLE was utilized to decrease blood pressure levels and blood sugar. Flavonoids, phenolics, alkaloids, and anacardic acid are frequently identified by phytochemical investigations as important bioactive substances that support antioxidant capacity and glucose management. Significant negative correlations between the dose of CLE and GLU levels clearly suggest that CLE might have a potential role in decreasing plasma GLU of Ulu chick.

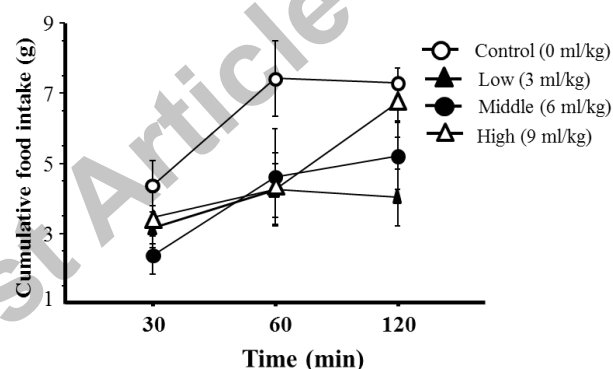


Fig. 1. Effect of several doses of CLE on feed intake in Ulu chicks. Values are means $\pm$ SEM. The number of samples used for analysis was 8-10.

Just like GLU a significant ($P < 0.05$) negative correlation between the doses of CLE and the plasma concentration of TCHO was detected ($307 [SE = 20] -7.52 [SE = 3.63]X, R^2 = 0.10$). No significant effect ($F[3, 36] = 1.59, p = 0.21$) was found between different treatments in terms of TCHO. These results align with a previous research that the administration of extract of cashew leaves significantly decreased TCHO levels in human (Olaniyan *et al.*, 2019). This findings also further affirms the report of Olaniyan (2016) who revealed that cashew leaf decreased CHO in rabbit. The decreasing TCHO by the CLE might be linked with the antioxidant phyto-constituents of the leaf (Okonkwo *et al.*, 2018). Significant negative correlations between the dose of CLE and TCHO levels clearly indicate that CLE might have a potential role in lowering plasma TCHO of Ulu chick.

A significant ($P < 0.01$) negative correlation between the doses of CLE and the plasma concentration of TG was detected ($162 [SE = 17] -9,01 [SE = 3.06]X, R^2 = 0.20$). There was a significant effect ($F[3, 33] = 6.04, p < 0.01$)

between treatments in terms of TG.

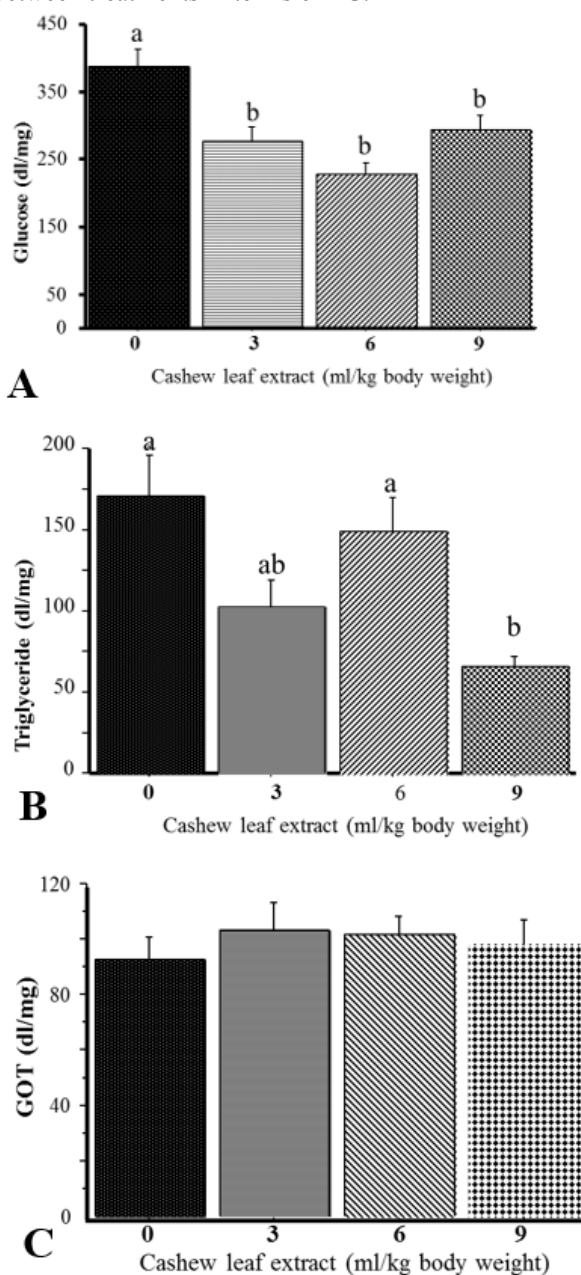


Fig. 2. Effect of several doses of CLE on glucose (A), triglyceride (B), and GOT (C) concentrations in Ulu chicks. Values are means $\pm$ SEM. The number of samples used for analysis was 9-10.

Based on the data, it seems that the highest levels of CLE significantly ($P < 0.01$) decreased plasma TG. This finding was similar with the previous report (Jaiswal *et al.*, 2016) who revealed that giving ethanol extract leave of cashew decreased plasma TG during 30 days in rats.

Olaniyan (2016) demonstrated that plasma TG of rabbits was lower when given 400 mg/kg of CLE. In addition, Ajao *et al.* (2022) revealed that plasma TG was significantly decreased by the CLE in rats. It is suggested that CLE is source of unsaturated fatty acids (UFAs) which have ability in decreasing TG due their potential to diminish the exposure of non-esterified fatty acids to hepatic tissues, thereby inhibiting one of the principal pathways involved in TG biosynthesis (Rosqvist *et al.*, 2014). Significant negative correlations between the dose of CLE and TG concentration clearly distinctly suggest that CLE may possess a potential function in reducing plasma TCHO levels in Ulu chicks.

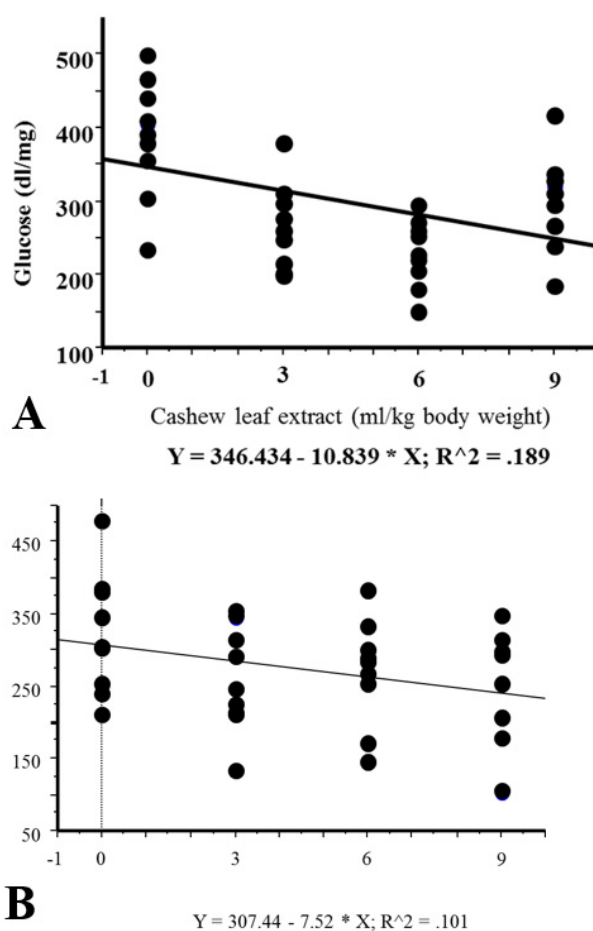


Fig. 3. Regression test curve of CLE on plasma glucose (A), and total cholesterol (B) concentration of plasma Ulu chicks. Values are means $\pm$ SEM. The number of samples used for analysis was 8-10.

No correlation was found between the doses of CLE and GOT concentrations in Ulu chick, and no significant effect was observed between treatments ($F[3, 33] =$

0.30, $p=0.90$). This result is consistent with the previous study (Okonkwo *et al.*, 2018) who revealed that when rats were given aqueous CLE did not significantly affect GOT levels. Although CLEs group increased slightly, it remained within the normal physiological range for poultry thus providing insufficient evidence to confirm a negative impact. According to Okonkwo *et al.* (2018), this might be related to the relative toxicity of the CLE administered which showed a little remedying effect when oral administration in low dose but becomes more toxic in high doses. Leaves of cashew tree contain phenolics with bioactivities, especially antioxidative activity. Since CLE had high antioxidative activity, it has possibility as a natural antioxidant to retard lipid oxidation and no adverse effect on used doses in the present study.

CONCLUSION

This study shows that oral administration of CLE decreases plasma GLU, TG and TCHO without altering GOT and feed intake in Ulu chicks.

DECLARATIONS

Acknowledgment

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Ethical considerations

This study was conducted following strict regulations in accordance with the recommendation in the Guide for Care and Use of Animal, Faculty of Agriculture and Animal Science, State Islamic University of Sultan Syarif Kasim Riau.

Generative AI and AI assisted technology statement

The authors declare that no generative AI and AI assisted technology was used in the creation of this manuscript.

Statement of conflict of interest

The authors have declared no conflict of interest.

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