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The effect of lemongrass (C*ymbopogon citratus*) supplement on growth performance and carcass characteristics of Pekin ducks

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ABSTRAK

Itik termasuk ternak yang penting dalam sektor pertanian, berkontribusi besar pada ekonomi Vietnam, terutama Delta Mekong. Baru-baru ini, suplementasi herbal pada pakan sudah umum dilakukan yang telah membawa banyak manfaat untuk petani. Herbal yang digunakan pada penelitian adalah serai. Itik berjumlah 96 ekor digunakan pada penelitian ini pada umur 1 hingga 8 minggu dan diberi empat perlakuan dengan tiga replikasi setiap perlakuan. Desain percobaan yang digunakan adalah acak lengkap yang bertujuan untuk menduga efek bubuk serai pada kinerja pertumbuhan itik dan karakteristik karkas. Itik diberi pakan yang sama dengan perlakuan pemberian bubuk serai yang berbeda (0; 0,5; 1; 1,5%). Itik diberi pakan dan minum secara *ad libitum.* Hasil menunjukkan bahwa ada penurunan linear dalam asupan pakan, peningkatan linear kenaikan berat badan hidup dan konversi pakan pada peningkatan proporsi serai dalam pakan dari 0% menjadi 1,5% ($P<0.05$). Penambahan 1,5% bubuk serai dalam pakan akan membantu bebek meningkatkan pertambahan bobot harian, asupan pakan dan rasio konversi pakan. Namun, bubuk serai tidak berpengaruh pada karakteristik karkas.

Kata kunci : penampilan itik, sifat karkas, suplementasi serai, pakan, tropis

ABSTRACT

Livestock including duck as one of crucial sector in agriculture, contributes a large proportion to Vietnam's economic and to Mekong delta's economic as well. Recently, herbal supplementation in feed is common which has brought many benefits for farmers and lemongrass is one of herbs is commonly used in many studies. A total of 96 ducks aged from 1 to 8-week-old was conducted through four treatments and three replicates per treatment. The experiment was a completely random design which aimed to estimate the effect of lemongrass powder on duck's performance and carcass characteristics. The birds in the treatments were fed by the same feed but different supplement ratio of lemongrass powder (0; 0,5; 1; 1,5%). Besides, the birds were fed and watered *ad libitum* in all of the treatments. The conclusion showed that there was a linear decrease in feed intake, linear improvements in live weight gain and feed conversion as the proportion of lemongrass in the diet was increased from zero to 1.5%, inclusion of 1.5% lemongrass in feed will help the ducks increase their daily weight gain, improve feed intake and feed conversion ratio ($P<0.05$). However, lemongrass powder had no effect on carcass characteristics ($P>0.05$).

Keywords: Duck's performance, carcass trait, lemongrass supplement, feed, tropical

INTRODUCTION

Poultry has played an important role in Vietnam livestock structure. To meet the increasing demand of Vietnam people, livestock not only had to be improved the quantity, but also increased the quality. Duck production provided a valuable protein resource and increased income for rural farmers in Mekong delta where farmers were still limited in using high technologies and applying new feed supplementation. Additionally, manure from duck was considered as a resource of organic fertilizer using for orchards and fish in the system of integrated farming in Vietnam (Nhan *et al.,* 2007).

Medical plants have been using commonly and gained more benefit for human, animal and poultry (Dhama *et al.,* 2018). Supplementation of poultry diets with utilizing herbal plants containing bioactive components have recorded promising achievements as a greatly natural feed supplement (Alagawany *et al.,* 2019). Additionally, nutritional strategies as well had to be formulated in order to maintain livestock performance (Nawab *et al.,* 2018). The poultry has more and more attention from researchers, particularly, a lot of feed formulations using herb were created for poultry such as ginger additive (Attia *et al.,* 2017; Gaikwad *et al.,* 2019; Abd El-Hack *et al.,* 2020), turmeric additive (Mahesh and Bhandary, 2018; Choudhury *et al.,* 2018) and garlic additive (Makwana *et al.,* 2017; Motasem *et al.,* 2018). Feed supplement was not only for increasing poultry productivity but also for increasing meat quality which was accessible by the farmers and consumers in the future easily. Moreover, there were a lot of challenges for small farmers such as infectious diseases and market price fluctuation (Delabouglise *et al.,* 2016). That was the reason why feed additives using herb which contained antibiotic composition, became more indispensable in duck feed industry.

Lemongrass was one of common herb which was used in numerous researches, not only for poultry but also for other livestock to improve their performance such as ruminant cattle (Khattab *et al.,* 2017; Robert *et al.,* 2015; Wanapat *et al.,* 2013). Lemongrass is available in several Asia countries which can be added in animal feed as supplementation because of containing steroids, alkaloids, phenols, saponin tannins, anthraquinones and considering as a viable alternative to antibiotics (Mmereole, 2010; Mukhtar *et al.,* 2012). Besides that, the chemical of lemongrass contains α-citral (40.55%), β-citral (28.26%), myrcene (10.50%) and geraniol (3.37%); DM (68.4%), CP (10.28%) and ADF (12.21%) (Soares *et al.,* 2013). In previous studies, lemongrass was mostly applied in case of broiler chickens (Chioma *et al.,* 2018; Tiwari *et al.,* 2018; Parade *et al.,* 2019). However, there were not many studies utilizing lemongrass on duck performance and carcass traits. Moreover, as a cheap and easy-to-find ingredient, lemongrass has large potential to apply in duck farming in rural areas.

The study was carried out to estimate the effect of different level of lemongrass supplement on duck growth performance and carcass characteristics as well. Then, choosing the most suitable level of lemongrass which was able to apply in duck farm.

MATERIALS AND METHODS

Study area/Location

The study was conducted at Ut Nhan Farm in Ben Tre province, one of 13 provinces in Mekong delta, Vietnam. The study was from 25 November, 2019 to 19 February, 2020.

Experimental Animal and Feed

The experiment was carried out using 1-day-old ducks, average weight was 45.5 g/bird, bought from Grimaud Viet Nam company as one kind of France ducks, named Pekin duck with meat producing purpose. All birds were vaccinated against Duck Plague and Avian Influenza at two and three-week-old. Ducks had *ad libitum* accessed to water and feed which contained in the Table 1.

Experiment Design and Management

Preparation of Lemongrass Powder

Fresh lemongrass was bought from the market, then, were washed with clean water, sliced, and put into the oven, using the temperature of 60-65^{o}C to dry for 6 hours (drying 2 kg per bath). The dried samples were ground into a fine powder and keep in the room temperature.

Experimental Design

The experiment was a completely random design with four treatments and three replicates (8 heads per one replicate and balanced for sex).

CT: feed without lemongrass powder

CT-0.5: feed + 0.5% lemongrass powder

Table 1. The Composition of Feed in the Experiment

Items	1 – 3-week-old	3 – 8-week-old
Ingredients (%)		
Broken rice	41.1	8.40
Rice bran	36.4	81.0
Soybean meal	11.0	5.00
Fish meal	11.2	5.30
Dicalcium phosphate	0.50	0.50
Mineral premix – Vitamin *	0.30	0.30
Nutrient composition		
Crude Protein (CP) (%)	20.0	16.0
Metabolizable Energy (MJ/kg DM)	12.6	11.3
Ether Extract (EE) (%)	5.31	5.82
Nitrogen-Free Extract (NFE) (%)	63.9	63.2
Crude Fiber (CF) (%)	4.50	6.79
Ash (%)	5.94	7.85
Calcium (%)	0.88	0.56
Phosphate (%)	0.94	1.30

*: Vitamin A: 2,500,000 UI; Vitamin D3: 600,000 UI; Vitamin E: 4,000 mg; Vitamin K3: 400 mg; Folic acid: 80 mg; Choline: 100,000 mg; Mangan: 14 g; Zn: 40 g; Fe: 32 g; Cu: 48 g; Iodine: 0.5 g; Co: 0.28 g; Se: 0.04 g

CT-1.0: feed + 1.0% lemongrass powder
CT-1.5: feed + 1.5% lemongrass powder

Ninety six one-day-old ducks were housed in experimental cages made from bamboo and net (1.4 m^2/8 heads). The experiment was started from the first day until the eighth week.

Data Collection

Growth Performance

The data in feed offered and leftover were collected every morning. The birds were weighed individually at beginning and weekly during the trial (every morning and before feeding). Feed with lemongrass supplementation was prepared 1 day before feeding.

Carcass Measurement

Carcass characteristics were measured at the end of the experiment, one male duck from each replication were randomly chosen. Ducks were weighed individually, slaughtered, scalded after bleeding. Then carcasses were separated into two part with left-side and right-side including breast, thigh, with the left side divided into commercial cuts (breast, thigh), then each part was weighed separately. Liver, gizzard and heart were weighed.

Statistical Analysis

The data were analyzed by ANOVA using General Linear Model procedure of Minitab 16.0. Variable mean showing the significant differences in the analysis of variance table were compared using Turkey test. The results were considered significantly different at $P<0.05$.

RESULTS AND DISCUSSION

There was a linear decrease in feed intake as the proportion of lemongrass in the diet which was increased (Table 2). In contrast, live weight gain and feed conversion showed linear improvements as the proportion of lemongrass in

the diet was increased. Carcass performance reflected the impact of increased final live weight (Table 3). The results of this study showed that lemongrass had strong effect on final live weight, feed intake, daily weight gain and feed conversion. The higher the level of lemongrass, the better the growth performance of ducks, particularly, daily weight gain, feed intake and final weight, which might be explained by the facts that the special aroma of lemongrass powder had increased the appetite of experimental ducks. Thus, the ducks had well absorbed the nutrients which were contained in lemongrass such as citral, flavonoids, geranio. The results were in line with the results of Khattak *et al.* (2014), Mmereole (2010), Ogbonna *et al.* (2017), Tiwari *et al.* (2018) and Parade *et al.* (2019). From these reasons, the ducks did not need to consume a higher amount of feed. Feed conservation in the study also gave the positive result at treatment 1.5% lemon grass. It was clearly that with the antibacterial, antifungal and antioxidant activities, along with some essential oils such as citral, myrene, geraniol, and so on in lemongrass which could promote the growth performance of experiment ducks, improved the feed conversion ratio. Inclusion of lemongrass on feed for duck improved growth performance during phases of the experiment, especially for final live weight, daily weight gain and feed conservation. This could be explained that lemongrass contained antibiotics which may help duck digest feed in the best way which was also recorded in the studies of Mmereole (2010), Shah *et al.* (2011), Mukhtar

Table 2. Mean Values for Performance of Ducks Supplemented with Lemongrass

Criteria	Treatments					
	CT	CT-0.5	CT-1.0	CT-1.5	SEM	P
Live weight						
Initial, g	192	182	202	194	8.02	0.439
Final, g	3005^{b}	3084^{b}	3146^{ab}	3256^{a}	35.5	0.006
Daily gain, g	57.4^{b}	59.2^{b}	60.1^{ab}	62.5^{a}	0.59	0.002
Feed intake, g/d	172^{a}	169^{a}	167^{ab}	161^{b}	1.67	0.011
Feed conversion ratio	3.48^{a}	3.36^{a}	3.26^{a}	2.96^{b}	0.05	0.001

Means with different superscript within the same coloumn indicate differ significantly ($P<0.05$); SEM: Standard Error of Means.

Table 3. Mean Value for Carcass Traits and Internal Organs

Item	Treatments				SEM	P
	CT	CT-0.5	CT-1	CT-1.5		
Carcass, %	70.94	72.45	72.81	72.08	2.06	0.925
Breast muscle, %	22.04	23.53	23.01	24.05	1.02	0.574
Thigh, %	7.76	8.17	8.38	8.53	0.35	0.483
Liver, g	72.00	72.7	75.97	76.03	2.98	0.206
Heart, g	15.97	15.70	16.10	17.40	1.16	0.395
Gizzard, g	69.12	70.98	72.37	73.40	8.91	0.220

et al. (2012) and Ogbonna *et al.* (2017). Additionally, Singh *et al.* (2011) said that lemongrass contains antimicrobial, antifungal and antioxidant activities along with some essential oils. It was clearly that lemongrass in diet acted as a growth stimulant, promoting body weight of the experimental ducks. Feed conversion ratio was better than others in the treatment of 1.5% lemongrass. The result showed the higher performance when compared with Rabbani *et al.* (2019), FCR from 3.16-3.34 at 56-day-old and it was similar to Kokoszyński *et al.* (2019), 2.96 – 3.09 at 8-week-old as well.

Carcass traits showed the reflection of increase in final weight and carcass traits and internal organs were better in the treatment of 1.5% lemongrass powder but there was no significance. From these results, it could be explained by the facts that carcass characteristics not only depended on lemongrass level but also depended on genotype, age, sex and crossbreeding. Moreover, other factors impacting their carcass traits and internal organs were the amount of feed intake, energy, protein, acid amino in feed diet. The support of essential fatty acids such as linoleic acid and oleic acid in lemongrass powder could actively promote the metabolism and growth ability of experimental meat ducks. It was debated by Belewu *et al.* (2011) as well. The results in this study were better than the results of Kokoszyński *et al.* (2019) with live weight (2359 – 2601 g), carcass weight (1616 -1803 g) at 8-week-old. Similarly, Ogbonna *et al.* (2017) recorded that lemongrass with 2% supplement did not have effect on carcass traits. Mukhtar *et al*. (2012) also gave the same result of no effect of lemongrass on carcass between treatments using lemongrass. Moreover, the result was similar with case of Japanese quail, there was no effect as well (Sariözkan *et al.,* 2016). Furthermore, Tiwari *et al.* (2017) debated that dressing percentage was higher than others in the diet using lemongrass, particularly breast weight but there was no significance.

CONCLUSION

There was a linear decrease in feed intake and linear improvements in live weight gain and feed conversion as the proportion of lemongrass in the diet which was increased from zero to 1.5% of the diet. Inclusion of 1.5% lemongrass in feed will help the ducks increase their daily weight gain, improve feed intake and feed conversion ratio. Carcass traits mostly reflected the effects of the increase in final liveweight. Especially, the carcass characteristics of Pekin ducks in treat of 1.5% had better performance when compared with other treatments.

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