Effects of dietary lipid sources on growth performance and carcass traits in Pekin ducks

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ABSTRACT This study was conducted to determine the influence of dietary lipid sources on growth performance, carcass traits and taste scores in Pekin ducks. A total of 1,500 fifteen-day-old ducks (820 ± 22 g) were blocked based on body weight (**BW**), and randomly allotted to 3 treatments with 10 replicates of 50 birds each (25 males and 25 females). The experiment lasted for 4 wk, and dietary treatments included 3 different lipid sources (soybean oil, duck fat, and palm oil), which were evaluated in corn-soybean meal diets (3250 kcal/kg metabolizable energy and 16.5% crude protein for grower diet and 3350 kcal/kg metabolizable energy and 15.5% crude protein for finisher diet). During days 15 to 28, feeding soybean oil and palm oil diets increased ($P < 0.05$) body weight gain (**BWG**), but decreased ($P < 0.05$) feed intake, feed-to-gain ratio (**F/G**) and caloric conversion compared with duck fat. During days 29 to 42, birds fed duck fat diet had higher BWG, but lower ($P < 0.05$) F/G and caloric conversion than those fed soybean oil and palm oil diets. Overall, feeding soybean oil diet increased ($P < 0.05$) BWG and final BW, but decreased ($P < 0.05$) F/G compared with palm oil. Birds fed duck fat diet had higher ($P < 0.05$) skin, subcutaneous fat and abdominal fat yield compared with palm oil. Left breast meat yield in soybean oil group was higher ($P < 0.05$) than that in duck fat and palm oil groups. Birds in soybean oil group had lower ($P < 0.05$) roasting loss, but higher ($P < 0.05$) comprehensive score compared with duck fat and palm oil. In summary, birds fed soybean oil diet had the best growth performance and taste scores for roasting, whereas the duck fat was better in abdominal fat and subcutaneous fat yield than soybean oil and palm oil in Pekin ducks from 15 to 42 d of age under the same nutritional level.

Key words: carcass, ducks, lipid, taste

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INTRODUCTION

Pekin duck, an excellent local species in China, has higher fat levels than other avian species (Baéza et al., 2002). It is usually consumed for Pekin roast duck by Chinese due to its high abdominal fat and subcutaneous fat percentage (Liu et al., 2019a). For roasting ducks, the abdominal fat and subcutaneous fat in Pekin ducks determine the nutritional, sensory characteristics, and fine flavor (Ruiz et al., 2001).

The adipogenesis in poultry can be manipulated by dietary factors, such as lipid sources, carbohydrates, protein, and specific amino acids (Wang et al., 2017). Several studies have been conducted to evaluate the effects of different nutrition density on growth performance and carcass traits in Pekin ducks (Xie et al., 2010; Zeng et al., 2015; Wen et al., 2017; Xie et al., 2017). Dietary lipid sources and levels is the most critical nutritional factor to modulate lipid quality, particularly fatty acid profiles (Cortinas et al., 2004; Fan et al., 2008; Allahyari-Bake and Jahanian, 2017). Several fats and/or oils such as soybean oil, palm oil, lard, and tallow were generally added into diets of Pekin ducks to enhance energy level (Hu et al., 2019; Liu et al., 2019a). It is necessary to establish the relationship between lipid sources and fat content (abdominal fat and subcutaneous fat) in Pekin ducks. It is well documented that animal fat rich in saturated fatty acids was digested less easily than vegetable oil rich in unsaturated fatty acids (Danicke, 2001), which was demonstrated in broilers fed tallow diets (Ferrini et al., 2008; Wongsuthavas et al., 2008; Zhang et al., 2011). On the contrary, several studies indicated that vegetable oils were superior compared with lard in ducks (Soren et al., 2009). A recent study showed that the palm oil was more preferable compared with soybean oil and lard in Pekin ducks for abdominal fat and subcutaneous fat content under the same metabolizable energy (**ME**): crude protein (**CP**) ratio from 15 to 40 d of age (Liu et al., 2019a).

However, little information was available for different lipid sources to allow both best growth performance and carcass traits for roasting in Pekin ducks. Undoubtedly, diets formulated to include the optimal lipid source under constant ME: CP ratio to Pekin roast ducks may

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Table 1. Diet composition (as-fed basis).

Items	Grower			Finisher		
	Soybean oil	Duck fat	Palm oil	Soybean oil	Duck fat	Palm oil
Ingredients, %						
Corn	42.00	43.16	47.33	53.59	52.86	51.59
Soybean meal (CP 46%)	3.10	3.32	5.34	5.00	5.00	5.00
Wheat flour (CP 14%)	10.00	10.00	10.00	10.00	10.00	10.00
Soybean oil	5.60	–	–	5.60	–	–
Duck fat	–	6.00	–	–	6.10	–
Palm oil	–	–	6.80	–	–	7.40
Rice bran	6.00	4.35	–	–	–	–
Corn gluten meal (CP 60%)	–	–	–	3.04	3.03	3.30
Wheat germ	6.00	6.00	3.36	3.00	3.00	3.00
Peanut meal	5.00	5.00	5.00	–	–	–
DDGS	14.00	14.00	14.00	11.76	12.00	11.70
Extruded full-fat soybean	3.00	3.00	3.00	3.00	3.00	3.00
Calcium phosphate	1.35	1.37	1.47	1.53	1.53	1.54
Limestone	1.49	1.34	1.28	1.23	1.23	1.22
Sodium chloride	0.30	0.30	0.30	0.32	0.32	0.32
L-Lysine•HCl (70%)	1.24	1.24	1.21	1.04	1.04	1.04
DL- Methionine (99%)	0.19	0.19	0.19	0.17	0.17	0.17
Threonine (99%)	0.35	0.35	0.34	0.34	0.34	0.34
Bile salts	0.03	0.03	0.03	0.03	0.03	0.03
Vitamin premix[1]	0.20	0.20	0.20	0.20	0.20	0.20
Trace mineral premix[2]	0.15	0.15	0.15	0.15	0.15	0.15
Analytical composition						
ME, kcal/kg[3]	3250	3250	3250	3350	3350	3350
Dry matter, %	88.8	88.8	88.9	88.7	88.7	88.9
Crude protein, %	16.51	16.52	16.52	15.52	15.52	15.51
Ether extract, %	10.22	10.30	10.50	9.28	9.70	10.90
Crude fiber, %	3.33	3.23	2.95	2.64	2.64	2.59
Total ash, %	5.93	5.82	5.57	5.32	5.32	5.30
Lysine, %	1.25	1.25	1.24	1.10	1.10	1.11
Methionine, %	0.44	0.44	0.44	0.44	0.44	0.44
Threonine, %	0.85	0.85	0.84	0.85	0.85	0.85
Tryptophan, %	0.16	0.16	0.16	0.15	0.15	0.15
Calcium, %	0.91	0.90	0.90	0.88	0.88	0.88
Total phosphorous, %	0.66	0.64	0.59	0.58	0.58	0.58
ME: CP (Ratio)[3]	197	197	197	216	216	216

[1]Provided per kilogram of diet: choline chloride, 1000 mg; vitamin A, 10,000 IU; vitamin D3, 3,000 IU; vitamin E, 20 IU; vitamin K3, 2 mg; thiamin, 2 mg; riboflavin, 8 mg; pyridoxine hydrochloride, 4 mg; cyanocobalamin, 0.02 mg; calcium-D-pantothenate, 20 mg; nicotinic acid, 50 mg; folic acid, 1 mg; biotin, 0.2 mg.

[2]Provided per kilogram of diet: 60 mg Fe ($FeSO_4 \cdot 7H_2O$); 10 mg Cu ($CuSO_4 \cdot 5H_2O$); 60 mg Zn ($ZnSO_4 \cdot 7H_2O$); 80 mg Mn ($MnSO_4 \cdot H_2O$); 0.3 mg Se ($Na_2SeO_3 \cdot 5H_2O$); and 0.2 mg I (KI).

[3]Calculated values. ME = metabolizable energy. CP = crude protein.

generate extra profits by meeting the requirement of abdominal fat and subcutaneous fat yield and reducing feed cost, which may provide substantial information to model nutrient input and carcass trait outcomes (Zeng et al., 2015). Compared with other animal fats such as lard and tallow, the utilization rate of poultry fat was higher in broilers (Zhang et al., 2011). Therefore, the objective of this study was to determine the impact of dietary lipid sources (soybean oil, duck fat, and palm oil) including animal fat and vegetable oils on growth performance and carcass traits of Pekin ducks fed diets with constant ME: CP ratio from 15 to 42 d of age.

MATERIALS AND METHODS

Experimental Design and Duck Husbandry

The Animal Welfare Committee of Dankook University (Cheonan, Choongnam, South Korea) approved the animal care protocol used for these experiments.

A total of 1,500 Pekin ducks (No. 4 strain) at 15 d of age with an average initial body weight (**BW**) of 820 ± 22 g were blocked on the basis of BW, and placed in a commercial farm with stainless steel battery brooders. The cages were equipped with feeder, nipple drinker, and raised plastic floors. All ducks were housed in an environmentally controlled facility. A 2-phase feeding program was used: a grower diet from days 15 to 28 and a finisher diet from days 29 to 42 of age. All diets (Table 1) were formulated to meet or exceed the NRC (1994) requirements for ducks and the dietary treatments were: (1) SO, soybean oil; (2) DF, duck fat; (3) PO, palm oil. There were 10 replications (cages) per treatment and 50 ducks per cage (25 males and 25 females) in a randomized complete block design. The ME: CP ratio (3250 kcal/kg ME and 16.5% CP for grower diet and 3350 kcal/kg ME and 15.5% CP for finisher diet) in each diet was kept constant. Diets were fed in pellet form and feed and water were provided *ad libitum* throughout each experiment. The fatty acid composition and peroxide values of lipid sources are

Table 2. Fatty acid composition and peroxide values of supplemental lipid sources.

Items, %/total fatty acid	Soybean oil	Duck fat	Palm oil
C12:0	0.21	0.11	0.13
C14:0	1.32	1.10	0.10
C16:0	23.9	21.3	10.8
C16:1	2.73	5.02	0.15
C18:0	13.3	7.12	3.97
C18:1	41.4	41.7	22.8
C18:2	10.1	20.5	54.1
C18:3	1.03	1.62	8.23
Total fatty acid, %/EE	88.5	88.4	88.3
Peroxide value (mEq/kg)	1.01	1.59	1.63

presented in Table 2. The environmental temperature and humidity were kept at 24°C and 60%, respectively.

Feed samples were analyzed for dry matter (Method 934.01), CP (Method 990.03), ether extract (954.02), crude fiber (Method 978.10), total ash (Method 942.05), calcium, and phosphorus (Method 985.01) according to the standard procedures of the AOAC (2002) with some modification (Liu et al., 2018). The amino acids of all diets were determined, following acid hydrolysis with 6 N HCl at 110°C for 24 h, using an amino acid analyzer (Biochrom 20, Pharmacia Biotech, Cambridge, England). Before acid hydrolysis, methionine, and cystine were oxidized with formic acid. Tryptophan was determined after NaOH hydrolysis for 22 h at 110°C (Liu et al., 2019b).

Sampling and Measurements

The ducks were weighed and feed intake (**FI**) was recorded at the beginning (day 15) and end of the trial (day 42), and body weight gain (**BWG**), FI, and feed-to-gain ratio (**F/G**) were calculated (Liu et al., 2019c). Mortality was recorded as it occurred, and the weights of dead birds were used to adjust F/G. European production efficiency factor (**EPEF**) was calculated as follows: EPEF = (Survival rate % * BW kg)/(F/G * Marketing age) * 10,000. At the end of the experiment, all birds (25 males and 25 females) from each replicate were sacrificed for the evaluation of carcass traits. Feed was withdrawn 4 h before processing. Birds were weighed and then placed in transportation coops. These birds were weighed, euthanized after electrical stunning by exsanguination, defeathered, eviscerated, and weighed again to obtain blood and feather weight, carcass weight (without neck and feet), breast meat weight, skin and subcutaneous fat weight, and abdominal fat weight after the carcasses were stored on ice overnight. Carcass yield was determined as the carcass weight in relation to BW and expressed as percentage of BW (%), whereas blood, feather, breast meat, skin, subcutaneous fat, and abdominal fat yield were expressed as percentages of the carcass weight. Roasting loss was determined as the carcass weight after roasting in relation to carcass weight before roasting and expressed as percentage of carcass weight (%). Ten roasting ducks were selected from each replicate for blind tasting and used to evaluate the taste score by 10 trained panelists. The comprehensive scores consist of color (30%), scent (10%), flavor (30%), and taste (30%) with different weighting coefficient. All the scores ranged from 1 to 10 and the higher score means the better sensory scores.

Statistical Analysis

Data were analyzed by ANOVA using the GLM procedure of SAS (SAS Inst. Inc., Cary, NC, US) with the cage being the experimental unit. Differences among treatments were separated by Duncan's multiple range test. Taste score data were analyzed using a multinomial model in PROC GENMOD. Variability in the data is expressed as standard error of the means and a probability level of $P < 0.05$ were considered to be statistically significant.

RESULTS

Growth Performance

During days 15 to 28, birds fed soybean oil and palm oil diets had higher ($P < 0.05$) BWG, but lower ($P < 0.05$) FI, F/G and caloric conversion than those fed duck fat diet (Table 3). During days 29 to 42, feeding duck fat diet increased ($P < 0.05$) BWG, but decreased ($P < 0.05$) F/G and caloric conversion compared with soybean oil and palm oil without any effect on FI. Overall, BWG in soybean oil and duck fat groups was higher ($P < 0.05$) than that in palm oil. Feeding duck fat diet increased ($P < 0.05$) FI compared with soybean oil and palm oil. F/G in soybean oil group was lower ($P < 0.05$) than that in duck fat and palm oil groups. Birds fed soybean oil diet had higher final BW than those fed palm oil diet. EPEF in soybean oil group was higher ($P < 0.05$) than that in palm oil group.

Carcass Traits

Birds fed duck fat diet had the highest ($P < 0.05$) skin and subcutaneous fat yield, followed by soybean oil and palm oil (Table 4). Feeding soybean oil and duck fat diets increased ($P < 0.05$) abdominal fat yield compared with palm oil. Left breast meat yield in duck fat and palm oil groups was lower ($P < 0.05$) than soybean oil group. There were no differences ($P > 0.05$) in eviscerated carcass, left leg meat, blood, or feather yield among all groups.

Taste Scores

Birds fed duck fat and palm oil diets ($P < 0.05$) higher roasting loss than those fed soybean oil diet (Table 5). Feeding soybean oil diet increased ($P < 0.05$) comprehensive score compared with duck fat and palm oil. Birds fed soybean oil and duck fat diets had

Table 3. Effect of dietary lipid sources on growth performance in Pekin ducks.[1]

Item[2]	Soybean oil	Duck fat	Palm oil	SEM[3]	*P*-value
Initial BW, g	820	820	821	11	0.76
Final BW, g	3518[a]	3501[a,b]	3440[b]	20	0.04
D 15–28					
BWG, g	1240[a]	1123[b]	1222[a]	12	0.02
FI, g	2540[b]	2753[a]	2584[b]	18	0.03
F/G	2.05[b]	2.45[a]	2.11[b]	0.02	0.02
Caloric conversion[4]	6.66[c]	7.97[a]	6.87[b]	0.04	0.01
D 29–42					
BWG, g	1458[b]	1558[a]	1397[c]	14	0.03
FI, g	3808	3826	3819	25	0.18
F/G	2.61[b]	2.46[c]	2.73[a]	0.02	0.03
Caloric conversion[4]	8.75[b]	8.23[c]	9.16[a]	0.04	0.01
D 15–42					
BWG, g	2698[a]	2681[a]	2619[b]	21	0.04
FI, g	6348[b]	6579[a]	6403[b]	30	0.03
F/G	2.35[b]	2.45[a]	2.44[a]	0.02	0.02
EPEF	534[a]	510[a,b]	503[b]	7.85	0.03

[1]Means represent 10 cages per treatment of 50 ducks per cage.
[2]BWG, body weight gain; FI, feed intake; F/G, feed-to-gain ratio; EPEF, European production efficiency factor.
[3]Standard error of the means.
[4]The caloric conversion was calculated by the formula: Caloric conversion (kcal/kg weight gain) = Dietary ME density (kcal/kg) × Feed intake (g) ÷ weight gain (g).

Table 4. Effect of dietary lipid sources on carcass traits in Pekin ducks.[1]

Item, %[2]	Soybean oil	Duck fat	Palm oil	SEM[3]	*P*-value
Eviscerated carcass	72.82	71.52	71.59	0.72	0.21
Skin	35.95[b]	38.39[a]	34.26[c]	0.29	0.03
Subcutaneous fat	38.61[b]	41.04[a]	36.78[c]	0.32	0.02
Abdominal fat	2.59[a]	2.65[a]	2.27[b]	0.06	0.04
Left breast meat	8.68[a]	8.03[b]	7.96[b]	0.07	0.02
Left leg meat	11.78	11.31	11.43	0.09	0.31
Blood	4.04	4.17	3.84	0.26	0.45
Feather	4.12	4.06	4.21	0.33	0.29

[1]Means represent 10 cages per treatment of 50 ducks per cage.
[2]Carcass traits yield, %.
[3]Standard error of the means.

Table 5. Effect of dietary lipid sources on taste scores in Pekin ducks after roasting.[1]

Item[2]	Soybean oil	Duck fat	Palm oil	SEM[2]	*P*-value
Roasting loss, %	5.56[b]	6.05[a]	6.10[a]	0.03	0.03
Comprehensive score	7.52[a]	6.95[b]	7.13[b]	0.07	0.03
Color (30%)	8.00[a]	8.00[a]	7.83[b]	0.06	0.04
Scent (10%)	6.92[a]	6.50[b]	6.83[a]	0.05	0.04
Flavor (30%)	7.50[a]	6.67[c]	7.00[b]	0.06	0.02
Taste (30%)	7.25[a]	6.33[c]	6.67[b]	0.06	0.02

[1]Means represent 100 ducks per treatment.
[2]Standard error of the means.

higher ($P < 0.05$) color score than those fed palm oil diet. Feeding soybean oil and palm oil diets increased ($P < 0.05$) scent score compared with duck fat diet. Flavor and taste scores in soybean oil group were higher ($P < 0.05$) than those in palm oil and duck fat groups.

DISCUSSION

Growth Performance

It is well documented that ducks could regulate the energy intake ingested via FI (Baéza, 2016; Bai et al., 2019). Previous studies demonstrated that both dietary ME and CP levels and ME: CP ratio might influence BWG, FI, and F/G in Pekin ducks (Xie et al., 2010; Zeng et al., 2015; Wen et al., 2017). Zeng et al. (2015) found that there was interaction between ME (2820, 3060, and 3300 kcal/kg) and CP (15, 17, and 19%) in growth performance of Pekin ducks with different ME: CP ratio (148 to 220) from 15 to 35 d of age. Furthermore, increasing dietary ME and CP levels under the same ME: CP ratio (178) improved F/G, but decreased FI without any effect on caloric conversion in Pekin ducks (Liu et al., 2019a). However, few literatures were available for different lipid sources under the same ME and CP levels in Pekin ducks. Various animal fats (lard, tallow, and duck fat) and vegetable oils (soybean oil and palm oil) are usually included to increase their energy density so that growth performance can be improved in poultry (Blanch et al., 1996; Zhao and Kim, 2017). In the current study, 3 different animal fat and vegetable oils (soybean oil, duck fat, and palm oil) were used to evaluate the lipid utilization in Pekin ducks fed diets with the same ME and CP levels. For the overall period, birds in soybean oil group had higher BWG, final BW, and EPEF, but lower F/G compared with palm oil, which was consistent with previous study (Soren et al., 2009). They found that soybean oil was better in growth performance than lard and palm oil in Khaki Campbell ducks. Similar results were observed in broilers (Ferrini et al., 2008; Wongsuthavas et al., 2008; Zhao and Kim, 2017). Zhang et al. (2011) indicated that feeding soybean oil diet increased BWG, but decreased F/G compared with tallow and poultry fat in broilers. Nevertheless, the results were not always consistent. A recent study indicated that palm oil was superior to lard and soybean oil for growth performance and EPEF under the same ME and CP level (2950 kcal/kg ME and 16.5% CP) in Pekin ducks from 15 to 40 d of age (Liu et al., 2019a). Furthermore, the addition of different lipid sources did not affect growth performance in Khaki Campbell ducks fed palm oil or lard diets (Zosangpuii et al., 2011), Cherry Valley ducks fed soybean oil or poultry fat (2880 kcal/kg ME and CP 18.2%; Hu et al., 2019). Similar results were also observed in broilers (Sanz et al., 2000; Viveros et al., 2009). Allahyari-Bake and Jahanian (2017) indicated that lipid sources (soybean oil, soy oil, soy free fatty acids or palm fat powder) did not affect growth performance in broilers. The inconsistency may likely be attributed to different ME and CP levels, different ME: CP ratio (158–197), different experimental duration, different duck breed, and diet composition (Liu et al., 2019a). Zeng et al. (2015) suggested both dietary ME and CP levels and ME: CP ratio could affect growth performance in Pekin ducks and they found the optimal ME and CP level in Pekin ducks was 3300 kcal/kg ME and 19% CP (ME: CP ratio = 174), respectively, for growth performance. When surplus protein was provided, the energy density need also be increased to make sure that sufficient energy was available for the efficient utilization of the protein (Zeng et al., 2015). Therefore, we suppose that the dietary ME and CP levels and ME: CP ratio may be the main reason for the above inconsistent results.

It is generally believed that vegetable oil rich in unsaturated fatty acids was digested more easily than animal fat rich in saturated fatty acids (Chung et al., 1993; Zollitsch et al., 1997) due to the higher digestibility. A higher degree of saturation and increasing fatty acid chain length led to poorer digestibility of the lipid source (Danicke, 2001). Zhang et al. (2011) suggested that poultry fat had a higher utilization rate than lard oil and tallow in broilers. Therefore, the duck fat with lower price was selected to evaluate the lipid utilization. Our results indicated that growth performance showed different response to different lipid sources in different phases. Duck fat had a lower fat digestibility than vegetable oils due to its higher content of long-chain saturated fatty acids. In the present study, the soybean oil was superior to duck fat in grower phase (days 15 to 28) and overall phase (days 15 to 42), while inferior to duck fat in finisher phase (29 to 42) based on growth performance. Besides, the different response to different lipid sources may be due to the different net energy (Liu et al., 2019a). Lipid has lower heat increment and higher net energy. However, the net energy values of different lipid sources in poultry were not accurate and even lack of values.

Carcass Traits

The carcass traits, especially fat deposition, were very vital to the Pekin ducks for roasting due to the particular cooking method. It is well accepted that Pekin ducks weighing 3.0 to 3.3 kg BW at 40 d of age with more than 37% subcutaneous fat yield were suitable for roasting ducks. In the present study, soybean oil and duck fat achieved the above requirement in high subcutaneous fat and abdominal fat yield under the same nutrition level. Birds fed duck fat diet had higher skin, subcutaneous fat and abdominal fat yield compared with soybean oil. Similarly, previous studies demonstrated that vegetable oils (soybean oil or linseed oil) decreased abdominal fat deposition compared with tallow in broilers (Ferrini et al., 2008; Wongsuthavas et al., 2008). This may be attributed to the increased uptake of fat as an energy source from vegetable oils by energy-demanding tissues such as skeletal muscle, which prevented deposition as fat (Sanz et al., 2000). On the contrary, dietary lipid sources (soybean oil, lard or palm oil) did not affect carcass traits in Pekin ducks (Liu et al., 2019a). They explained that the lack of effect may be due to both the constant ME and CP levels and ME: CP ratio. We speculated that the consistency may be attributed to different feeding program (2 phases) and relatively higher ME used in our study. Soren et al. (2009) also reported on effect of lipid sources on carcass traits in Khaki Campbell ducks. In our study, left breast meat in soybean oil group was higher than that in duck fat and palm oil groups, which was not in agreement with previous studies in Pekin ducks (Fan et al., 2008; Wen et al., 2017; Liu et al., 2019a). We supposed that the ME level may be the reason because ME used in our study was relatively higher compared with previous studies (Zeng et al., 2015). However, more studies are needed to evaluate the effects of lipid sources on carcass traits under relatively high ME level in Pekin ducks. In addition, the above inconsistency may be attributed to the genetic selection in recent years, both for rapid BWG and muscular mass deposition (Liu et al., 2019a).

Taste Scores

This is the first study to determine the effects of lipid sources on taste scores after roasting. Birds in soybean oil group had lower roasting loss, but higher comprehensive score compared with duck fat and palm oil. This may be due to the different fatty acid profiles, which was easy to modulate the fatty acid composition by using different fat sources in diets in ducks (Baéza, 2016). Previous studies indicated that flavor and juiciness were improved when the intramuscular fat was above 2.5% in ducks (Fernandez et al., 1999; Chartrin et al., 2006). The higher skin, subcutaneous fat, and abdominal fat yield in soybean oil and duck fat groups may mirror the taste scores. More studies are needed to evaluate the effects of lipid sources on taste evaluation due to the upgraded consumption.

CONCLUSIONS

Taken together, birds fed soybean oil diet had best growth performance, EPEF, carcass traits, and taste scores for roasting, followed by duck fat and palm oil in Pekin ducks from 15 to 42 d of age under the same nutritional level (3250 kcal/kg ME and 16.5% CP for grower diet and 3350 kcal/kg ME and 15.5% CP for finisher diet).

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