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Comparison of production performance of Pekin duck, control population and meat line of Kuttanad duck#

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Abstract

A study was conducted to compare the production parameters among commercial Pekin ducks, the control population as well as meat line of Kuttanad ducks. Day-old male ducklings (n=60 each) of commercial Pekin duck, control population as well as meat line of Kuttanad duck selected for body weight over four generations were randomly allotted to five replicates of 12 birds each and were utilised for the study. The body weight, body weight gain, feed intake, feed conversion ratio, livability and carcass characteristics were calculated for the study period of eight weeks. The results showed that there was significantly ($p<0.05$) higher body weight, body weight gain and feed intake in Pekin ducks followed by the Kuttanad meat line and control population of Kuttanad ducks. The feed conversion ratio was significantly ($p<0.05$) better in the Pekin ducks compared to the meat line as well as the control population of Kuttanad ducks. The mortality rate had an increasing trend in accordance with the improvement in growth rate in Pekin and Kuttanad meat line. The carcass characteristics expressed in percentage of live weight did not show any significant difference among the Pekin duck, control population and meat line of the Kuttanad duck.

Keywords: *Pekin duck, Kuttanad duck, body weight, feed intake, feed conversion ratio, carcass characteristics*

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The human population is expected to reach nine billion before entering the second half of this century with a 60 to 70 per cent expected increase in meat consumption (Makkar *et al*., 2014). Poultry is the only sector after fish, which can fill the gap between the demand and supply of meat in the 2050s. Duck production is one of the fast-growing industries after broiler production which was having an average increase of 1.72 per cent per year from the year 2014 to 2017 (Kovitvadhi *et al*., 2019). Commercial hybrid broiler ducks available in the market need expensive feed and better management to perform well. At the same time, non-descriptive native ducks are scavengers and can thrive on less feed and minimal management. They can survive and perform well in the hot and humid climate of the state than high temperatures and humidity compared to commercial hybrid broiler ducks. Kuttanad duck is the coloured native duck breed of Kerala, which yields more eggs compared to any other Indian duck breed. Nowadays, Kuttanad ducks are preferred more for their gamy meat than eggs. To satisfy the consumer's preference, conventional selection for 8th-week body weight is being carried out since 2012 at Kerala Veterinary and Animal Sciences University Poultry & Duck Farm, Mannuthy. After four generations of conventional selection, it was possible to achieve a mean body weight of 1660.49 g (Ancy, 2018) from the initial body weight of 1103.38 g at eight weeks of age. In the present study, the production performance of the Pekin ducks, the control population as well as meat line of Kuttanad ducks are compared.

Materials and methods

The experiment was conducted at the Department of Poultry Science, College of Veterinary and Animal Sciences, Mannuthy for eight weeks from 28th February, 2019 to 25th April, 2019. Sixty numbers each of day-old male ducklings of commercial Pekin duck, control population and meat line of Kuttanad duck which were selected for body weight over four generations at University Poultry and Duck Farm, Mannuthy were utilised for this study. All Ducklings were wing banded and weighed individually before housing. The ducklings of each type were randomly allotted to five replicates of 12 birds each.

The ducklings were brooded using 60 watts incandescent bulbs at a height of one foot from the slat floor for 24 hours in the first week and only at night during the second week. A 24-hour photoperiod was provided during the entire experimental period. The temperature inside the shed was between 24-35°C and the relative humidity (RH) was 72-80 per cent throughout the experimental period. The birds were provided *ad libitum* clean drinking water during the entire course of the experiment and were fed *ad libitum* with a broiler starter ration for up to four weeks and a broiler finisher ration from five to eight weeks of age. The rations were formulated as per BIS (2007) specifications. The proximate composition of compounded feed was analysed as per AOAC (2012) and presented in Table 1. The metabolisable energy was calculated as per ingredient composition in the literature. The individual weight of the birds was recorded at day-old and every fortnightly interval (14, 28, 42 and 56 days of age) throughout the experimental period and the mean was calculated. The body weight gain was calculated from the replicate-wise mean body weight for each 14 days. Feed intake was recorded replicate-wise at the end of every 14-day period as the difference between the total feed offered and the leftover. The feed conversion ratio (FCR) was calculated replicate-wise based on the data on body weight gain and feed consumed for each 14-day period.

At four and eight weeks of age, a total of 15 ducks (one bird per replicate) were randomly selected and slaughtered humanely to study the difference in carcass characteristics among the treatments. The weight of each duck was measured before slaughter. The ducks were processed and the eviscerated weight, breast, deboned breast (without skin), leg, thigh, drumstick, abdominal fat, heart, liver, gizzard and neck weight were measured and their percentages against live weight were calculated.

The above-mentioned data were analysed by one-way ANOVA using SPSS (version 24.0).

Table 1. Chemical composition of broiler starter and finisher diet

Composition	Broiler starter	Broiler finisher
Dry matter (%)	90.28	91.04
Crude protein (%)	22.02	20.04
Ether extract (%)	8.24	9.64
Crude fibre (%)	3.43	3.31
Total Ash (%)	8.27	8.49
Acid insoluble ash (%)	1.64	1.60
NFE (%)	58.04	58.52
Calcium (%)	1.04	1.11
Available Phosphorus (%)	0.44	0.50
Calculated metabolisable energy (kcal/kg)	3098	3203
Lysine	1.30	1.16
Methionine	0.51	0.49

Results and discussion

The mean body weight of ducklings at day old, two weeks, four weeks, six weeks, and eight weeks of age was significantly ($p<0.05$) higher in commercial Pekin ducks followed by the Kuttanad meat line and lowest in the control population of Kuttanad duck (Table 2) except at two and four weeks of age when the mean values of the control population and the meat line of Kuttanad duck were not significant. The results agree with the findings of Ancy (2018), Ahmad *et al.* (2021) and Bugiwati *et al.* (2021). The significant ($p<0.05$) increase in sixth- and eighth-week mean body weight of the Kuttanad meat line compared to the Kuttanad control population with no significant difference at the earlier ages (two and four weeks) indicates that the age of selection influenced the age of response to growth.

The mean body weight gain at 0-2 weeks period was significantly ($p\leq0.05$) higher in commercial Pekin ducks compared to the Kuttanad control population and the value of the Kuttanad meat line was comparable (Fig. 1). The mean body weight gain at 3-4 weeks and 7-8 weeks period was significantly ($p<0.05$) higher in commercial Pekin duck compared to control population as well as meat line of Kuttanad duck. The body weight gain was significantly ($p<0.05$) higher in commercial Pekin duck, followed by the Kuttanad meat line and lowest in the Kuttanad control population during the 5-6 weeks period and overall period (2373.59, 1640.17 and 1426.05 g, respectively). There was an increase in body weight gain till six weeks of age and a slowdown of the same thereafter in all three types of ducks. The results were similar to the findings of Ancy (2018).

Table 2. Mean (±SE) body weight of experimental ducks at fortnightly intervals, g

Treatments	Age				
	0-day	2	4	6	8
Pekin (T_1)	44.64^{a} ±0.55	165.714^{a} ±4.35	781.03^{a} ±27.80	1649.43^{a} ±22.05	2418.23^{a} ±54.59
Kuttanad control (T_2)	39.27^{c} ±0.50	136.35^{b} ±3.89	567.49^{b} ±18.77	1106.95^{c} ±24.40	1465.31^{c} 22.07
Kuttanad improved (T_3)	41.64^{b} ±0.42	149.59^{ab} ±8.66	622.92^{b} ±19.64	1237.37^{b} ±20.93	1681.81^{b} ±40.20
p-value	0.0005	0.016	0.0005	0.0005	0.0005

Means bearing different superscripts within column differ significantly at 5% level

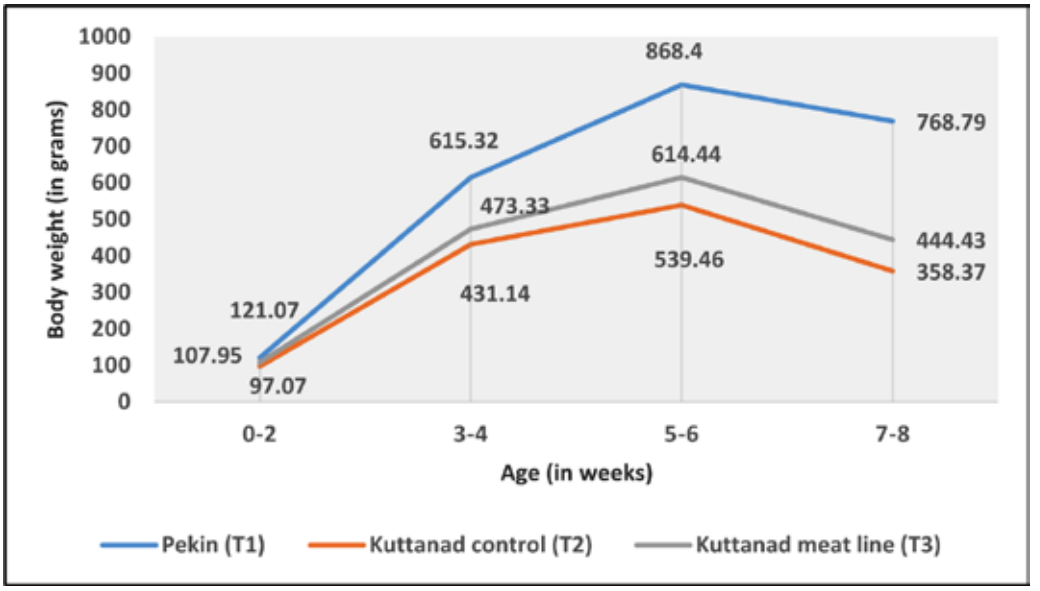

Fig. 1. Mean body weight gain of experimental ducks at fortnightly intervals

Table 3. Mean (±SE) feed intake in experimental ducks at fortnightly intervals, g

Treatments	Periods (in weeks of age)				Cumulative value (0-8)
	0-2	3-4	5-6	7-8	
Pekin (T_1)	254.75 ±13.23	1178.31^{a} ±40.88	2798.36^{a} ±96.66	2784.20^{a} ±60.61	7015.62^{a} ±173.21
Kuttanad control (T_2)	269.07 ±16.15	959.71^{b} ±22.47	2046.08^{c} ±44.61	1832.18^{c} ±54.40	5107.03^{c} ±94.35
Kuttanad meat line (T_3)	252.22 ±13.29	1040.06^{b} ±40.65	2385.90^{b} ±06.66	2206.13^{b} ±97.00	5884.30^{b} ±135.08
p value	0.676	0.003	0.0005	0.0005	0.0005

Means bearing different superscripts within column differ significantly ($p<0.05$)

Table 4. Mean (±SE) feed conversion ratio (FCR) in experimental ducks at fortnightly intervals, g

Treatments	Periods (in weeks of age)				Cumulative value (0-8)
	0-2	3-4	5-6	7-8	
Pekin (T_1)	2.12^{b} ±0.15	1.92^{b} ±0.06	3.22^{b} ±0.04	3.68^{b} ±0.23	2.96^{b} ±0.10
Kuttanad control (T_2)	2.78^{a} ±0.17	2.23^{a} ±0.06	3.80^{a} ±0.13	5.15^{a} ±0.28	3.59^{a} ±0.09
Kuttanad improved (T_3)	2.38^{ab} ±0.19	2.20^{a} ±0.07	3.89^{a} ±0.04	4.99^{a} ±0.18	3.59^{a} ±0.03
p value	0.049	0.008	0.0005	0.001	0.0005

Means bearing different superscripts within column differ significantly at 5% level

The mean fortnightly feed intake of birds during 0-2 weeks period did not show any significant difference among the treatment groups (Table 3). The corresponding value from 3-4 weeks was significantly ($p<0.05$) higher in Pekin duck than control population as well as meat line of Kuttanad duck. At 5-6 and 7-8 week periods, the mean fortnightly feed intake was significantly ($p<0.05$) higher in commercial Pekin duck followed by Kuttanad meat line and lowest in Kuttanad control population. Similar result was reported by Ancy (2018) in

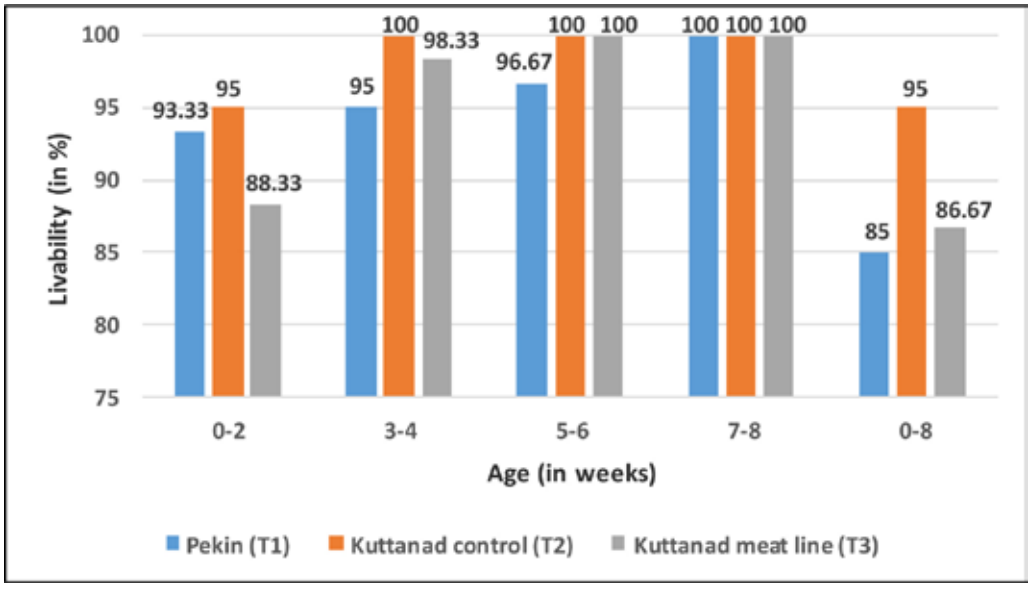

Fig. 2. Livability in experimental ducks at fortnightly intervals

Table 5. Mean (±SE) carcass characteristics in experimental groups of ducks at four and eight weeks of age, %

Treatments	Pre-slaughter weight (g)	Eviscerated yield	Breast	Thigh	Drumstick	Wings	Abdominal fat	Heart	Liver	Gizzard
At 4 weeks of age										
T_1	792 ±93.23	62.14 ±2.05	6.54 ±0.15	5.49 ±0.29	11.3 ±0.41	5.96 ±0.41	-	0.71 ±0.04	2.8 ±0.17	3.55 ±0.27
T_2	632 ±71.10	58.72 ±1.19	6.67 ±0.26	6.28 ±0.27	11.37 ±0.47	5.29 ±0.49	-	0.67 ±0.04	3.12 ±0.19	4.47 ±0.23
T_3	632 ±120.78	60.25 ±0.83	6.39 ±0.22	6.52 ±0.60	10.1 ±0.64	5.64 ±0.78	-	0.78 ±0.04	3.24 ±0.29	4.25 ±0.43
p-value	0.433	0.284	0.667	0.229	0.19	0.726	-	0.183	0.386	0.148
At 8 weeks of age										
T_1	2428.00^a ±205.20	65.06 ±0.79	16.57 ±0.54	4.83^b ±0.15	8.67 ±0.46	10.04 ±0.42	0.64 ±0.15	0.59 ±0.03	2.11 ±0.20	2.55 ±0.17
T_2	1528.00^b ±044.40	62.27 ±3.48	14.82 ±0.70	5.46^b ±0.29	8.47 ±0.30	10.52 ±0.51	1.1 ±0.29	0.63 ±0.02	2.16 ±0.15	2.95 ±0.15
T_3	1628.00^b ±106.54	67.2 ±0.71	14.21 ±1.35	6.35^a ±0.35	8.85 ±0.59	9.72 ±0.52	1.23 ±0.14	0.65 ±0.03	2.41 ±0.15	3 ±0.13
p-value	0.001	0.287	0.222	0.007	0.854	0.522	0.151	0.345	0.426	0.106

Means bearing different superscripts within the column differ significantly ($p<0.05$)

Pekin duck compared to Kuttanad duck and Al-Marzooqi *et al.* (2019) in commercial broiler compared to local Omani chicken.

The mean fortnightly FCR of birds during 0-2, 3-4, 5-6- and 7-8-week periods was significantly ($p<0.05$) better in commercial Pekin duck compared to control population as well as meat line of Kuttanad duck (Table 4) which was in accordance with the findings of Ancy (2018), Devaki *et al.* (2019) and Kwon *et al.* (2014).

The livability percentage of experimental ducks (Fig.2) was lower in Pekin ducks with mortality up to six weeks of age,

the mortality was up to four weeks of age in the Kuttanad meat line and up to two weeks only in the Kuttanad control population with no mortality thereafter. This was in accordance with the findings of Chodova *et al.* (2021) who observed a higher mortality percentage (10) in fast-growing Ross 308 compared to slow-growing Isa Dual (0) at six weeks of age.

The carcass characteristics (Table 5), viz. eviscerated yield, breast yield, thigh yield, drumstick yield, wings yield, abdominal fat, heart yield, liver yield and gizzard yield percentage did not show any significant difference among Pekin ducks, control population and meat line of Kuttanad ducks at fourth and eighth week except thigh yield percentage which was significantly higher in Kuttanad control population compared to meat line of Kuttanad duck and Pekin duck at eight weeks of age. Similar to the present finding, Ancy (2018), reported no significant difference in eviscerated yield percentage between Pekin and Kuttanad ducks. Isguzar *et al*. (2002) and Ahmad *et al.* (2021) revealed no significant difference in eviscerated yield, thigh yield and giblets yield percentage between Pekin and native ducks. Cyriac *et al*. (2020) observed a significantly ($p<0.05$) higher breast yield percentage in slaughtered birds of the Kuttanad meat line compared to that of the base population in the 8th week, but the difference was non-significant in the 10th and 12th week. She observed no significant difference in wings yield and abdominal fat percentage between slaughtered birds of the Kuttanad meat line and base population in the 8th, 10th and 12th week.

Conclusion

The study on production parameters among Pekin duck, the control population as well as meat line of Kuttanad duck concludes that the Kuttanad meat line had significant ($p<0.05$) improvement in body weight from the day-old to eight weeks of age compared to that of Kuttanad control population as a result of four generations of individual selection for eighth week body weight. The mean body weight gain of the Kuttanad meat line was not significant compared to that of the Kuttanad control population up to four weeks of age and the same was significantly ($p<0.05$) higher at 5-6 weeks period which made the overall body weight gain up to eight weeks significant. The feed intake of the Kuttanad meat line was significantly ($p<0.05$) higher than that of the Kuttanad control population which led to a significant ($p<0.05$) increase in body weight gain of the Kuttanad meat line after four weeks of age. Even though there was a significant ($p<0.05$) increase in body weight and weight gain in the Kuttanad meat line compared to the Kuttanad control population, the FCR was similar in both groups and less than that of the Pekin duck. The mortality rate had an increasing trend in accordance with the improvement in the growth rate in Pekin and the meat line of Kuttanad duck. Although there was no significant difference in the percentage of carcass characteristics among the treatments, there was a proportionate change in the weight of carcass characters against pre-slaughter weight.

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Conflict of interest

The authors report no conflict of interest.

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