



Research Article

Effect of Different Lysine Regimen on Performance Characteristics and Economic Efficiency of First Progeny of Aseel Parents Flock

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Abstract | This experiment was designed to evaluate the effects of various lysine regimens on the growth performance of local Aseel chicken progeny. In total, 240 day-old chicks constituting 60 of each Lakha, Peshawari, Mianwali and Mushki varieties, selected and placed in three-tier battery cages following Randomized Complete Block Design. These chicks were equally divided into three groups according to lysine regimens named L1 (1.3% lysine in starter, grower and finisher diets), L2 (1.4% in starter and grower and 1.2% lysine in finisher diet) and L3 (1.5% in starter, 1.3% in grower and 1.1% lysine in finisher diet) made accessible to them in phases for 0–6th weeks of their initial growth period. The same diet plan and schedule was followed by their parent's flock. The data for growth parameters was analyzed by ANOVA technique and Duncan's Multiple Range test (DMR) was applied to equate treatment means. The findings of present experiment revealed that feed intake was non-significantly different ($P>0.05$). However, body weight, weight gain, feed conversion ratio, and feed efficiency were significantly ($P<0.05$) better in the progeny from parents fed L3 regimen. It was concluded that providing L3 regime of lysine in diet of parent can improve the growth performance of progeny.

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Keywords | Economic aspects, Feed conversion ratio, Weight gain, Lysine, Aseel, Progeny performance



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Introduction

The significance of traditional backyard poultry is indispensable as an income generating source, especially for household womenfolk of tropical and semi-tropical areas (Rajkumar *et al.*, 2017). Local poultry birds have great contribution and constitute about 80-99% of the total poultry genotypes being kept in villages, towns of developing and under

developing countries worldwide (Batool, 2017). The share of indigenous birds is very important in poultry industry, livestock and its about 15 and 32 percent for meat and egg production, respectively (Pakistan Agriculture Research Council, 2017). They mostly keep local breeds of poultry birds such as Aseel chickens because of their high resistance to dangerous pathogens, contagious diseases and abruptly changing drastic weather conditions (Jatoi *et al.*, 2014). Aseel

is the most resilient among the local chicken breeds with high weight at maturity, phenotypic characters i.e., upright posture, beautiful plumage coloration, pea comb, marvelous gait, high vigor and resistance towards diseases making it an equally adjustable breed in all climatic conditions (Haunshi *et al.*, 2012). Improvement in growth related parameters can be enhanced by improving in genetics, housing and nutrition (Pinheiro *et al.*, 2011; Hussain *et al.*, 2018). As there is a finite reservoir of nutrients and energy within the avian embryo for supporting its growth and development. The embryo growth rate determines the metabolic needs, the fast growing breeds have more metabolic requirements than their antecedents and increased death rates, growth obstructions and low muscular deposit are the consequences of poor nourishment (Halevyo *et al.*, 2000). Whereas, the chicks being deprived of food remain 50% deficient in immunity of IGF-1 of blood plasma (Kita *et al.*, 2002). Many researchers have proved the breeder nutrition association and its influence on their offsprings (Calini and Sirri, 2007; Hocking, 2007; Kid, 2003, 2015). It has been worked out for several years to manipulate the parent flock diet keeping in view the improved production parameters in such a way to improve the growth of subsequent progeny which is more economical (Calini and Sirri, 2007). The maternal nutrition has been reported to influence the progeny growth especially in heavy meat type breed (Foye *et al.*, 2006; Zukiwsky *et al.*, 2021). However, the contradictions also exist for maternal diet effects on the growth performances of their subsequent progeny (Lopez and Leeson, 1995). Lysine is considered as the first one limiting amino acid being used in formulation of feed as a crucial source of crude protein for synthesis of meat protein (Campestrini *et al.*, 2010). Studies have also been publicized that the increase in dietary lysine content during rearing phase between week 1-3 conquered an increase in body weight and body weight gain (Mateos *et al.*, 2014; Faridi *et al.*, 2015), while increase in dietary lysine content during the rearing period resulted in increased length and weight of digestive track in broilers (Franco *et al.*, 2006; Beski *et al.*, 2015; Ullah *et al.*, 2012). Lysine supplementation in feed also increased the activity of pancreatic enzymes as well as digestion and absorption of nutrients during early phase of growth in broilers (Sklan and Noy, 2000). Studies have also been carried out on phase-feeding of lysine to enhance the initial growth of Aseel which is very slow and it was found that 3-phased feeding

lysine regimen was found to be more preferable as it improved the initial growth parameters and the livability percentage (Batool *et al.*, 2018c). Keeping in view these foregoing facts the present study was formulated with the main purpose to evaluate the impact of various lysine regimens constituting the phase feeding in parent flock and its subsequent impact on their first progeny.

Materials and Methods

Study site

This experiment was conducted at Indigenous Chicken Genetic Resource Center (ICGRC), Ravi campus, University of Veterinary and Animal Sciences Lahore, Pakistan.

Approval from animal ethics committee

Prior approval was taken from institution to conduct the experiment and whole project was supervised by Institutional Ethics Committee of University of Veterinary and Animal Sciences, formulated for monitoring animal health and care during experimental use. Bird care and welfare prioritized throughout the experiment.

Experimental plan

In total 240 days old chicks from four varieties Peshawari, Mushki, Mianwali and Lakha (60 per each variety) were randomly distributed in three lysine groups. Three lysine regimens L1 (1.3%), L2 (1.4-1.2%) and L3 (1.5-1.3-1.1) were offered to Group A, B and C, respectively. L1 containing 1.3% lysine was offered throughout six weeks in one phase and 1.4 and 1.2% lysine offered in L2 regimen for 3, 3 weeks in two phases, while L3 constituting 1.5 %, 1.3% and 1.1% lysine was offered for every two subsequent weeks in three phases. L-Lysine Sulphate 70% (Chengfu/Fufeng China) was used as lysine source. The Aseel birds were tagged according to their respective regimen and group then placed in randomized complete block design (RCBD) with factorial arrangement of 4(varieties) × 3(lysine regimens) × 20 birds (replicates) with one bird in each.

Housing and management of experimental birds

These birds were provided with compound ration twice a day and *ad-libitum* supply of water through nipple drinking system fitted within each 4-tiered cage having 1.8, 1.2 and 0.4m length, width and height, respectively. The bird's cages were placed

in a well-ventilated house with temperature and relative humidity maintained throughout the whole experiment between 21-32°C and 60-75%, respectively. The hypothesis of this experiment was to improve the initial growth of parents as well as their first progeny through supplementation of lysine in phases as per growth rate and need.

Data collection and statistical analysis

The growth parameters including mean six weeks feed intake obtained by subtracting feed residue through feed offered, body weight, weight gain, feed conversion ratio (FCR), feed efficiency and livability percent. The economic analysis in terms of saleable meat was also done and tabulated. The data obtained were analyzed by factorial ANOVA technique and GLM (General linear model) of SAS software (SAS, 2002-03).

Results and Discussion

Present study was conducted to evaluate the impact

of lysine regime in parental diet on the progeny performance and economic efficiency in Aseel chicken. Results of this experiment showed no effect of lysine regimes on cumulative six weeks feed intake was found ($P > 0.05$). However, the interactions among various regimens and varieties revealed significant differences ($P \leq 0.05$) where feed intake was highest in Peshawari Aseel within L2 (1.4-1.2% lysine) lysine regimen and lowest feed intake was noted in Mushki Aseel receiving L1 (1.3% lysine) in diet (Table 1). These results of feed intake among lysine regimens are contrary to the parent flock being significantly variable ($P \leq 0.05$) while those of varieties for the said parameter are in accordance as validated by Batool *et al.* (2018c). The present diversity among result might be due to the genetic effect as was influenced by variable lysine dietary needs (Mehmood *et al.*, 2012; Jatoi *et al.*, 2014). The progeny birds might reflected their feed intake activities in different manner depending upon consequent parental nutritive as well as other related factors (Nonis and Gous, 2013).

Table 1: Growth performance (0-6 week) of first progeny from parental Aseel chicken flock fed on various lysine regimens.

Variables		Feed intake(g)	Body Weight(g)	Weight gain(g)
Lysine levels (%)				
1.3(L1)		1013.23±3.25	439.53±5.75 ^b	403.36±5.54 ^b
1.4-1.2(L2)		1041.95±8.36	450.39±4.86 ^{ab}	414.24±.51 ^{ab}
1.5-1.3-1.1(L3)		1023.80±2.61	457.01±3.78 ^a	423.80±3.35 ^a
Varieties				
Lakha		1014.60±3.33	450.62±3.70 ^{ab}	416.13±3.63
Mianwali		1023.97±3.14	460.32±6.66 ^a	419.73±6.66
Mushki		1014.52±2.97	442.17±3.90 ^b	411.02±3.62
Peshawari		1052.22±4.42	442.80±6.78 ^b	408.32±6.62
Lysine levels (%) × Varieties				
1.3 (L1)	Lakha	1019.85±7.01 ^b	450.00±6.26 ^{cd}	415.35±6.05 ^{cde}
	Mianwali	1017.40±6.00 ^b	456.95±17.00 ^{cd}	418.00±5.98 ^{cd}
	Mushki	1002.45±5.52 ^b	460.25±5.40 ^{bcd}	425.80±5.52 ^{bcd}
	Peshawari	1013.20±6.79 ^b	390.90±4.78 ^f	354.30±3.92 ^g
1.4-1.2 (L2)	Lakha	1012.40±5.41 ^b	436.75±6.85 ^{de}	403.20±6.85 ^{def}
	Mianwali	1036.30±5.35 ^b	488.20±9.55 ^a	446.90±8.34 ^{ab}
	Mushki	1019.25±3.43 ^b	422.30±5.27 ^e	387.65±5.25 ^f
	Peshawari	1099.85±7.68 ^a	454.30±9.99 ^{cd}	419.20±9.68 ^{cd}
1.5-1.3-1.1 (L3)	Lakha	1011.55±4.75 ^b	465.10±4.52 ^{abc}	429.85±4.53 ^{abc}
	Mianwali	1018.20±3.89 ^b	435.80±5.22 ^{de}	394.30±3.90 ^{ef}
	Mushki	1021.85±4.89 ^b	443.95±6.84 ^{cde}	419.60±4.49 ^{cd}
	Peshawari	1043.60±4.64 ^{ab}	483.20±8.41 ^{ab}	451.45±6.47 ^a

Values are stated as $M \pm SEM$ (Mean±Standard Errors of Means), whereas various superscripted alphabets specify significant differences at $p < 0.05$.

Mean six weeks body weight among three lysine regimens and four varieties showed significant ($P \leq 0.05$) variations in body weight (g). Significantly higher ($P \leq 0.05$) body weight (457.01 ± 3.78 g) was depicted by L3 than L2 and L1 regimens i.e., 450.39 ± 4.86 , 439.53 ± 5.75 g), respectively. Among Aseel varieties, Mianwali showed significantly higher body weight (460.32 ± 6.66 g) than Lakha, Mushki and Peshawari. Similarly, among interactions of regimens and varieties, Mianwali displayed higher body weight (488.20 ± 9.55 g) within L2 lysine regimen (Table 1). This study revealed a body weight of progeny in association to its parental flock which specifies the consequent genetic impact of parental body weight transferred in more pronounced way (Batool *et al.*, 2018c). The analogous findings of significant ($P \leq 0.05$) higher body weight of progeny had been found and reported by Hussain *et al.* (2016). This significantly improved weight among the progeny birds might be due to the multiple allelic interaction and genetic assortment (Akram *et al.*, 2014) in general and the availability of dietary lysine at optimal level in comparison with growth needs of parents and hence the genetic impact of strong parental health profile on its off springs (Batool *et al.*, 2021). Various studies have demonstrated that the offspring body weight and growth performance of birds is directly influenced by maternal nutrition incorporated into eggs (Peebles *et al.*, 2002; Kidd, 2003; Hocking, 2007). The maternal nutritive effect ends up when the egg is laid out, however the prompting the epigenetic modifications can also switch the muscle progenitors as was proved by the studies of Saccone and Puri (2010). The egg size, albumen and yolk proportion, hatching conditions and period are also important factors for birds progeny weight and onwards growth performance (Ulmer-Franco *et al.*, 2010; Kidd, 2015).

Mean six weeks body weight gain showed significant variations ($P \leq 0.05$) among lysine regimens, wherein L3 displayed the higher gain (423.80 ± 3.35 g) than other two regimens (L2, L1). The weight gain by varieties was in-significantly variable among them, however Peshawari variety depicted significantly higher ($P \leq 0.05$) weight gain (451.45 ± 6.47 g) with L3 lysine regimen in interactions between regimens and varieties (Table 1). Here in the present research work on Aseel bird the increasing trend in weight gain along with increasing age was found in parents flock and similar more pronounced trend in weight gain was found among progeny birds than their

parents kept under same conditions as parents which might be manifested due to timely fulfilment of lysine requirements parallel with age and genetic transfer of healthy parental traits among their off springs specifically and in general as was worked out by Krishna and Rani (2017). Jatoi *et al.* (2021) also experimentally proved the greater body weight and weight gain in subsequent progeny of four closed bred parental flocks of Japanese quails.

Significant variations ($P \leq 0.05$) were observed in both lysine regimens and Aseel varieties when the FCR or performance of feed was considered. L3 regimen displayed better FCR (2.66 ± 0.02) than L1 and L2 lysine regimens Lakha showed better FCR (2.68 ± 0.03) than Mushki, Mianwali or Peshawari variety. As far as interactions in 3 regimens and 4 Aseel varieties are considered, Peshawari depicted better FCR in L3 regimen (Table 2).

The better feed conversion ratio among parental flock as was demonstrated by Abbas *et al.* (2016) and later on by Batool *et al.* (2018c) was due to the dietary lysine phase feeding. Significant variations ($P \leq 0.05$) were perceived among the lysine regimens and Aseel varieties for feed efficiency. L3 showed higher feed efficiency (0.41 ± 0.00), while both Lakha and Mianwali displayed higher feed efficiency (0.41 ± 0.01). However, among interactions in lysine regimens and Aseel varieties, Peshawari showed higher feed efficiency with L3 regimen (Table 2). The feed efficiency and performance of birds is highly dependent upon parental nutrition especially the maternal one as depicted by Moraes *et al.* (2014). As far as the findings of this study are observed it becomes obvious that the proper provision of lysine as growth enhancer component of feed when given in phases as per growth obligation of age can improve the FCR as well as FE among parents (Batool *et al.*, 2018c) which intern better improves the all growth parameters among the progeny.

The progeny birds revealed a non-significant difference ($P \leq 0.05$) in mean livability percent among all 3 offered lysine regimens, L1, L2 and L3, four varieties, Lakha, Mushki, Mianwali, Peshawari as well as among the interaction between 3 lysine regimens and 4 varieties (Table 2). However, non-statistically better livability percent was depicted by these Aseel progeny birds ought to be due to the amplified antibody response, cell mediated immunity and positive carryout effects

Table 2: *Growth parameters and Livability (0-6 week) in the first progeny of parental Aseel chicken flock fed on various lysine regimens.*

Variables		Folds of increase	FCR	Feed efficiency	Livability (%)
Lysine levels (%) /Regimens					
1.3(L1)		7.18±0.02	2.78±0.03 ^{ab}	0.39±0.01 ^b	98.56±0.53
1.4-1.2(L2)		7.22±0.03	2.80±0.07 ^a	0.40±0.01 ^{ab}	99.44±0.32
1.5-1.3-1.1(L3)		7.24±0.02	2.66±0.02 ^b	0.41±0.00 ^a	99.66±0.28
Varieties					
Lakha		7.24±0.03	2.68±0.03 ^b	0.41±0.00 ^a	99.20±0.46
Mianwali		7.24±0.03	2.73±0.03 ^{ab}	0.41±0.01 ^a	98.98±0.36
Mushki		7.17±0.03	2.70±0.02 ^b	0.41±0.00 ^{ab}	99.48±0.36
Peshawari		7.21±0.02	2.87±0.10 ^a	0.39±0.01 ^b	99.13±0.49
Lysine levels (%) /Regimens × Varieties					
1.3 (L1)	Lakha	7.28±0.05 ^{ab}	2.66±0.04 ^c	0.41±0.01 ^{bc}	99.20±0.80
	Mianwali	7.13±0.04 ^{bc}	2.72±0.08 ^{bc}	0.41±0.01 ^{abc}	97.65±1.29
	Mushki	7.11±0.04 ^c	2.61±0.03 ^c	0.42±0.00 ^{ab}	99.20±0.80
	Peshawari	7.21±0.05 ^{abc}	3.12±0.04 ^a	0.35±0.01 ^c	98.20±1.25
1.4-1.2 (L2)	Lakha	7.26±0.07 ^{abc}	2.83±0.06 ^{bc}	0.40±0.01 ^{cd}	99.30±0.70
	Mianwali	7.24±0.07 ^{abc}	2.62±0.05 ^c	0.43±0.01 ^{ab}	100.00±0.00
	Mushki	7.11±0.04 ^c	2.80±0.04 ^{bc}	0.38±0.00 ^d	99.25±0.75
	Peshawari	7.25±0.05 ^{abc}	2.95±0.28 ^{ab}	0.40±0.02 ^{cd}	99.20±0.80
1.5-1.3-1.1 (L3)	Lakha	7.17±0.04 ^{bc}	2.56±0.02 ^c	0.42±0.00 ^{ab}	99.10±0.90
	Mianwali	7.35±0.04 ^a	2.84±0.03 ^{bc}	0.39±0.00 ^{cd}	99.30±0.70
	Mushki	7.28±0.05 ^{ab}	2.69±0.03 ^c	0.41±0.00 ^{abc}	100.00±0.00
	Peshawari	7.16±0.03 ^{bc}	2.54±0.03 ^c	0.43±0.01 ^a	100.00±0.00

Values are stated as $M \pm SEM$ (Mean $\pm$ Standard Errors of Means), whereas various superscripted alphabets specify significant differences at $p < 0.05$.

of their Aseel parents flock provided with protein and Lysine as per age and growth requirements (Batoool *et al.*, 2018c).

Table 3: *Economic analysis (0-6 week) of Aseel chicken progeny birds as influenced by parents fed on various lysine regimens.*

Cost items	Lysine phases/ Regimens		
	L1	L2	L3
Feed consumed/Chick (g)	1013.23	1041.95	1023.80
Lysine consumed/Chick (g)	12.50	13.17	13.24
Total Lysine cost (Rs)	3.00	3.10	3.14
Total feed cost (Rs)	45.60	46.89	46.07
Miscellaneous cost (Rs)	42	40	35
Total cost/ chick (Rs)	110.6	109.99	104.21
Total live weight/chick (g)	439.53	450.39	457.01
Sale price/Kg live weight (Rs)	450	450	450
Total Sale price/chick (Rs)	197.78	202.68	205.65
Net profit/chick (Rs)	87.18	92.69	101.44
Profit (%)	78.82	84.27	97.34

*Purchase price of day-old chick has not been added as they were hatched out from self-reared parental flock.

The economic analysis with respect to saleable meat and its profit which was 97.34, 84.27 and 78.82 % in L3, L2 and L1, respectively (Table 3). The findings of present experiment revealed the enhanced body weight and weight gain trend with respect to meat among the progeny birds fed on L3 lysine regimen as compared to their parent flock reared under same conditions of feed and feeding like their off springs. However, the feed intake among different lysine regimens i.e., L1, L2 and L3 which was statistically non-significant ($P \leq 0.05$) contrarily to their parents. The progeny birds publicized extra deposition of protein and subsequently the changed more enriched protein profile in terms of lean meat. This higher increase in body weight in terms of lean meat/ economic efficiency among the progeny birds fed on L3 (1.5-1.3-1.1%) lysine regimen, might have due to the timely fulfilment of lysine need with age and the genetic impact of enhanced parental protein profile been reared on the same lysine regimen i.e., L3, as was worked out by Batoool *et al.* (2018c) in her experiments entitled “Effect of various lysine regimens on growth, productive and reproductive performance

of indigenous Aseel". Three phased lysine regimen was also found to be more effective than two or one phased lysine regimen with respect to the increase in body weight and lean meat among the other poultry bird like Japanese quails as was pointed out by Abbas *et al.* (2016) in his experiment "Effect of different dietary lysine regimens on the growth performance and economic efficiency of Japanese quails".

Conclusions and Recommendations

From the findings of present study, it is clear that the Aseel progeny performed better by feeding the L3 lysine regimen. Hence, it was concluded that the provision of lysine 1.5%, 1.3% and 1.1% in the starter, grower and finisher diets of parent flocks can improve the progeny growth and economic efficiency.

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Conflict of interest declaration

The authors have no financial or other association with persons or organizations that could have inappropriate influence on this paper or bias the contents of this research article.

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