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Research Article

### COMPARATIVE STUDY ON GROWTH PERFORMANCE OF NAKED NECK, RHODE ISLAND RED, FAYOUMI AND AUSTRALORP BREEDS IN LOCAL CONDITIONS

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**Abstract:**

*This study was conducted on 240-day-old chicks. The birds were divided into four groups (A, B, C, D) of every breed. Experiment findings were water and feed consumption, body weight, FCR, dressing percentage, organs weight, size, and mortality. Results showed significant ( $P < 0.05$ ) high consumption of water in Rhode Island Red, intermediate in Fayoumi and Naked Neck and lowest in Australorp. Feed intake was high ( $P < 0.05$ ) in Rhode Island Red breed than other breeds. The results of body weight showed significantly ( $P < 0.05$ ) high in Australorp and Rhode Island Red, intermediate in Fayoumi and lowest in Naked Neck. Results showed non-significant ( $P > 0.05$ ) difference in feed conversion ratio among all breeds. Results of dressing % shows non-significant ( $P > 0.05$ ) difference between all breeds. Result showed relative weight of heart was higher ( $P < 0.05$ ) in the Australorp than other breeds while relative weight of Liver, Spleen, Proventriculus, gizzard, duodenum and ilium showed non-significant ( $P > 0.05$ ) among all breeds. Relative size of duodenum showed significant ( $P < 0.05$ ) difference which was high in Rhode Island Red followed by Naked Neck and Fayoumi with lowest size in Australorp. Relative weight of jejunum was higher ( $P < 0.05$ ) in Australorp and lowest in Fayoumi. Non-significant ( $P < 0.05$ ) differences among the relative sizes of jejunum and ilium in all breeds. Naked Neck, Fayoumi and Australorp showed lowest ( $P < 0.05$ ) mortality than Rhode Island Red. It was concluded that Australorp breed had improved body weight, feed conversion and carcass traits while Naked Neck had low mortality. Australorp breed gives better performance as compared to other breeds.*

**Key Words:** Growth Performance, Health Status, Naked Neck, Rhode Island Red, Fayoumi, Australorp

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**INTRODUCTION:**

Indigenous or rural breeds are mostly mentioned as a pool of heterogeneous entities and are found in several phenotypes and ecotypes, with diverse performance (Msoffe, 2003; Fayeye, 2005). Worldwide, these breeds are significant for their qualities such as disease resistibility, adaptability, and better sturdiness in local climatic and environmental conditions. Indigenous breeds production serves as an essential means of animal protein and sources of an incomes especially for females in developing countries (Zaman *et al.*, 2004). In local markets of rural and urban areas, demand of indigenous chicken's meat and eggs is high due to consumers' preference for texture and taste from these products. Although local poultry can be an effective source of subsidiary income for poor farmers, it has always been neglected and because of short supply of indigenous chicken and their products carry much higher price than that of commercial poultry (Atela *et al.*, 2016). The studies revealed that price of per kg body weight of indigenous chicken can be 50-60 % higher than commercial chickens (Rath *et al.*, 2015). Meat and eggs of these chickens are favored more than non-indigenous commercial birds (Dessie and Ogle, 2001). In Pakistan, Rhode Island red, Naked neck, Desi and Fayoumi and other indigenous breeds are reared as backyard chickens, and commonly known as 'Desi' (Sahota and Bhatti, 2003).

Naked Neck breed is important indigenous breed found in Pakistan. This breed has excellent resistance against certain diseases and is very well adjusted in the harsh tropical environmental conditions and with very poor nutritional systems (Mwacharo, 2007). This breed is better than the local and full feathered breeds in terms of eggs production, growth rates, eggs quality, meat yielding traits and this chicken breed can produce double standard number of eggs under enhanced nutritional as well as managerial conditions (Islam and Nishibori, 2009). Furthermore, this chicken breed has a better and improved heat dissipation system. Feather structure and decreased feathering concentration can promote the loss of heat which indirectly improves overall productivity of chicken and feed efficacy (Peters, 2000). This high performing trait of Naked Neck breed to thermoregulatory role of the genes which they keep (Dessie and Ogle, 2001).

Amongst indigenous chickens imported within our country Rhode Island Red breed has achieved further status as compared to other indigenous breeds because of their excellent quality of producing eggs, which is 178 eggs in a single cycle of production (Javed *et al.*, 2003). Rhode Island Red was imported in Pakistan since 1980s. Rhode Island Red is exotic chicken breed

having qualities of hardiness and high meat and egg productivity (Sahota and Bhatti, 2003). Furthermore, this breed's stay in Pakistan have made it well adjusted to the local climatic and environmental conditions. Fundamentally, Rhode Island Red is a two-purpose chicken of American class and is gaining more importance in the villages and rural areas of the country known as 'Golden birds' (Ashraf *et al.*, 2003).

An Egyptian breed Fayoumi mainly formed for production of egg and is recognized to be best adapted in tropical atmosphere and hot climatic conditions (Barua *et al.*, 1998). This breed usually act as a scavenger bird, survives usually with the farmer in villages, but the size of chicken is very small, lay small sized eggs, yields a very low carcass, therefore have a very low economic profit. Farmers keep this breed at farms and their homes due to strong immunity against common diseases and its non-broodiness character (Rajput *et al.*, 2005). Fayoumi birds are excellent layers of white eggs with small size. The chicken is also very fast to mature, starts laying eggs in an about four to five months after hatching (Ekarius, 2007). Because of small body size, this breed is not a good meat producer and its average egg weight is also smaller than 45.91g. In rural areas, farmers keep this breed for both in scavenging and intensive system and they like it because of its bright color. This breed is disease resistant, very precisions in the quick maturing and have an excellent quality of flying and capacity of easy escaping (Akhtar, 2007).

Australorp chickens are kept under many production systems (Goromela, 2009). These chickens are kept as layer birds in the south part of Tanzania and hence have better scavenging abilities. (Mata and Mwakifuna, 2012). Black Australorp (BA) is an exotic dual-purpose breed, and also producing high number of eggs and meat than other indigenous breeds but on other hand this breed is not well adjusted to stressful environmental situations such as poor nutrition, high temperature and disease conditions (Islam and Nishibori, 2009; Ali *et al.*, 2000).

Naked neck, Rhode Island red, Fayoumi and Australorp poultry breeds are being reared in village populations of Pakistan broadly, and there is lack of information regarding the growth performance of all these four chicken breeds. Therefore, this experimental trial was arranged to compare the growth performances of the Naked neck, Rhode Island red, Fayoumi and Australorp to examine finest potential chicken regarding growth performance and health status in local conditions.

**MATERIALS AND METHODS:****Experimental design and management**

This experimental trial was performed at Poultry experimental station, Sindh Agriculture University Tandojam. Two hundred forty chicks of four breeds i.e. Naked Neck, Rhode Island Red, Fayoumi and Australorp, sixty from each breed were purchased from poultry research institute Rawalpindi. The duration of research was ten weeks (70 days). Experimental birds were reared in Brooder-cum-grower houses and were reared under floor housing system on litter. Brooder houses were cleaned regularly at weekly intervals and disinfected completely. Four bulbs of 100watt, were fitted inside the hover for brooding of chicks. Birds were brooded and reared under the standard temperature (95° F-98° F) at chick level for the first week, and this was followed by reduction of 5°F per week until the temperature of 70°F was attained. The availability of artificial light for the birds was twenty-four hours for

the first week and then this was followed by reduction of 1 hour per week. Lighting schedule and temperature management (Table 1) were followed by recommendations of Department of Poultry Husbandry. Starter feed formulated with increased CP% (21.19) formulated from local feed mill in Hyderabad *ad libitum* were fed to chicks for the first six weeks and growing birds were shifted from starter feed to grower feed (formulated with increased CP% (19.20) on the end of 6th week (Table 2). Growing birds were provided day light only. Frequent stirring of litter material was done, and litter material was completely changed on alternative weeks. Experimental birds were protected against deadly diseases by vaccination and medication programmes as per recommendations of Department of Poultry Husbandry. All the farm operations were also carried out under a proper supervision by followings the complete SOPs

**Table 1: Lighting schedule, temperature, and daily feed allowances**

Week	Lighting (hours)	Temperature (F)	Feed intake /day (grams)
1 <sup>st</sup>	24	95° F	15
2 <sup>nd</sup>	23	90° F	25
3 <sup>rd</sup>	22	85° F	36
4 <sup>th</sup>	21	80° F	40
5 <sup>th</sup>	20	75° F	45 (5 <sup>th</sup> to 10 <sup>th</sup> week)
6 <sup>th</sup>	19	70° F	
7 <sup>th</sup>	18		
8 <sup>th</sup>	17		
9 <sup>th</sup>	16		
10 <sup>th</sup>	15		

**Table 2: Nutrients composition and Feed Ingredients**

Ingredient	Layer Starter	Layer Grower
	Rate of Inclusion	
Rice	60.25	65.47
Soybean meal	32.5	28
Dl-methionine	0.15	0.13
Feed premix	0.5	0.5
L-lysine	0.1	0.1
NaCl	0.3	0.3
Limestone	1.2	1.2
Dicalcium phosphate	2	1.8
Corn gluten meal	3	2.5
Calculated chemical composition of diet		
ME (kcal/kg)	2998	3023.9
Available P %	0.531	0.485
Ca %	0.988	0.949
Methionine %	0.496	0.440
Methionine + cystine %	0.80	0.72
Lysine %	1.21	1.09
Crude Protein %	21.19	19.20

### Parameters Measured

The growth performances data (Feed intake, Water Intake, feed conversion ratio and Weight gain) were recorded at weekly intervals. Dressing percentage and relative weight of organs were recorded at the end of trial. Mortality was also recorded during the experiment. Feed was provided to the chicks on daily basis and leftover were collected at the end of day and then finally consumed feed intake was calculated on weekly basis. Fresh water was provided twice daily and leftover water was measured by measuring cylinder and then finally consumed water was calculated weekly basis. Feed conversion ratio was determined based on the total feed consumed by bird for gaining one kg weight. From each breed 10% of birds were randomly selected on the first day of every week and weekly body weight was calculated. At the end of trial two chickens from every breed were first weighed and then slaughtered. Following de-fathering, carcass weights were noted, and dressing percentages were determined. After slaughtering, heart, liver, spleen, proventriculus, gizzard, and intestine were detached with the use of surgical instruments, and their weights and sizes were recorded. Dead chicks were collected from each breed when noticed, and finally the mortality percentage was determined.

### Statistical Analysis

Data on all parameters were analyzed by using MS. Excel and JMP (SAS 2002-03).

### RESULTS:

The growth performance results (body weight, feed, and water intake, Feed conversion ratio) and health status including mortality during the entire research period is given in Table-3. The average weight of day-old chick was highest in Rhode Island Red, intermediate weight was found in Australorp and Fayoumi breeds and lowest in Naked Neck breed. Performance regarding feed intake was highest ( $P < 0.05$ ) in Rhode Island Red breed follows by Australorp, and Naked Neck breeds and lowest intake of feed was noted in Fayoumi breed. Results of water

intake showed significant ( $P < 0.05$ ) high consumption of water in Rhode Island Red breed, intermediate in Fayoumi and Naked Neck breeds and lowest consumption of water in Australorp breed. Feed conversion ratio was high in Naked Neck breed followed by the other three breeds and statistical analysis showed non-significant difference in among all the breeds. According to results Australorp breed gained significant ( $P < 0.05$ ) highest weight as compared to Naked Neck and Fayoumi during the entire ten weeks that was followed by Rhode Island Red which also showed non-significant difference among Australorp while there was also non-significant difference between live body weights of Naked Neck and Fayoumi breeds. The results on health status of breeds showed high (3%) mortality rate recorded in Rhode Island Red breed while mortality rates were intermediate (2%) in Fayoumi and Australorp breeds and lowest (1%) mortality rates were seen in Naked Neck breed.

The results on dressing % and relative weight and size of organs (edible and non-edible) are given in Table-4. Dressing % was high in Rhode Island Breed followed by Australorp and Fayoumi breeds and lowest dressing % was found in Naked Neck. Results showed that relative weight of heart was higher in Australorp breed follows by the other three breeds with no significant difference among them. Statistical analysis showed non-significant differences among the relative weights of liver, spleen, proventriculus, gizzard, duodenum, and ilium of all four breeds whereas relative weight of jejunum was significantly ( $P < 0.05$ ) higher in Australorp and Naked Neck with no significant difference among them follows Rhode Island Red, and lowest was recorded in Fayoumi. Results of relative size of duodenum showed significant ( $P < 0.05$ ) difference among breeds which was higher in Rhode Island Red follows by Naked Neck and Fayoumi and lowest size was noted in Australorp breed whereas statistical analysis showed non-significant ( $P < 0.05$ ) differences among the relative sizes of jejunum and ilium in all breeds.

**Table 3: Comparative growth performances and health status of Naked Neck, Rhode Island Red, Fayoumi and Australorp**

Parameters	Groups				p-Value (P<0.05)
	Naked Neck	Rhode Island Red	Fayoumi	Australorp	
Body Weight	924.66 ± <sup>B</sup> 31.65	1060.9 ± <sup>A</sup> 58.03	934.8 ± <sup>B</sup> 27.56	1064 ± <sup>A</sup> 58.61	0.0079*
Feed Intake	2436.73 ± 163.08	2455.52 ± 55.33	2178.33 ± 183.01	2439.03 ± 99.35	0.1012
Water Intake	871.33 ± <sup>AB</sup> 37.63	939.66 ± <sup>A</sup> 35.38	907.03 ± <sup>A</sup> 27.94	814.33 ± <sup>B</sup> 25.50	0.0074*
Feed conversion	2.63 ± 0.21	2.32 ± 0.16	2.31 ± 0.13	2.29 ± 0.04	0.0731
Mortality %	1%	3%	2%	2%	1%

**Table 4: Comparative Dressing % and relative organ weights (g) of Naked Neck, Rhode Island Red, Fayoumi and Australorp**

Parameters	Groups				p-Value (P<0.05)
	Naked Neck	Rhode Island Red	Fayoumi	Australorp	
Dressing %	53.8 ± 5.11	59.95 ± 0.04	56.14 ± 0.00	58.27 ± 1.36	0.0921
Heart	0.47 ± <sup>B</sup> 0.43	0.50 ± <sup>B</sup> 0.00	0.53 ± <sup>B</sup> 0.01	0.59 ± <sup>A</sup> 0.00	0.0011*
Liver	2.05 ± 0.28	2.35 ± 0.35	1.86 ± 0.04	1.82 ± 0.07	0.0786
Spleen	0.29 ± 0.04	0.22 ± 0.11	0.18 ± 0.00	0.20 ± 0.03	0.2080
Proventriculus	0.28 ± 0.02	0.28 ± 0.06	0.28 ± 0.03	0.27 ± 0.02	0.9820
Gizzard	2.77 ± 0.21	2.17 ± 0.35	2.17 ± 0.45	2.07 ± 0.32	0.1321
Duodenum (Weight)	1.02 ± 0.18	1.07 ± 0.10	0.83 ± 0.03	0.82 ± 0.00	0.0445
Duodenum (Size)	1.09 ± <sup>AB</sup> 0.13	1.21 ± <sup>A</sup> 0.23	0.87 ± <sup>AB</sup> 0.09	0.82 ± <sup>B</sup> 0.02	0.0348
Jejunum (Weight)	1.42 ± <sup>A</sup> 0.00	1.23 ± <sup>B</sup> 0.07	1.07 ± <sup>C</sup> 0.04	1.54 ± <sup>A</sup> 0.04	< .0001*
Jejunum (Size)	2.30 ± 0.29	2.07 ± 0.06	1.87 ± 0.11	2.12 ± 0.10	0.0765
Ilium (Weight)	0.79 ± 0.09	0.82 ± 0.10	0.60 ± 0.08	0.81 ± 0.05	0.0480
Ilium (Size)	2.34 ± 0.37	1.90 ± 0.11	1.70 ± 0.24	1.89 ± 0.33	0.1139

**DISCUSSION:****Comparative growth performance**

Results of current experiment shows average highest day-old weight was highest in RIR (41.8g), sub-high in Australorp (37.8g), intermediate in Naked Neck (32.2g) and low in Fayoumi (30.4g). Same results were also observed by Khawaja *et al.*, 2012 who observed highest day-old chicks' weights in the Rhode Island Red (31.30g) in comparison to Desi (25.9g) and Fayoumi chicken (20.90g). The highest weight of day-old chicks of Rhode Island Red could possibly be due to large size of egg than Naked Neck, Fayoumi and Australorp breeds. Live body weight was significantly higher in Australorp breed (1064 ± 58.61) followed by Rhode Island Red (1060.9 ± 58.03) at the age of 10<sup>th</sup> week, same pattern of results were explained by

Mothibedi *et al.*, 2016 who observed that the weight of body is significant high in the Australorp x Tswana crossbreed males than pure breed males from 10 weeks (1139.48±31.26g vs. 1088.56±32.47g). Measure of efficiency of chicken in converting feed mass into increases of the desired output trait is said to be feed conversion ratio. Differences in Feed conversion ratio values in various research studies may be due to different in composition, moisture content, managerial practices and environmental conditions. Effects of rearing system on consumption of feed and Feed conversion ratios indicates that the feed intake is significantly higher in birds reared in cages than deep litter system. Up to 2<sup>nd</sup> week of age, desi birds in deep litter systems consume significantly extra feed compared to birds in cage system. The



current results feed intake of all breeds was noted and compared with each breed. In current results there were significant difference in feed consumption of all four breeds at different ages.

#### Comparative dressing % and relative weight of organs

In poultry industry, the high carcass yield provides satisfaction to consumer and more profit to farmers. The parts yield and carcass of fast-growing bird's presents high yields when compared with slowly growing chicks which exists high yields of thigh and drumsticks (Fanatico *et al.*, 2005). Two chickens were selected from every group and slaughtered at the ending of research trial to continued dressing out percentage and were compared among each group. Dressing (%) was higher in Rhode Island red ( $59.95 \pm 0.04$ ) followed by Australorp ( $58.27 \pm 1.36$ ), Fayoumi ( $56.14 \pm 0.00$ ) and lowest in Naked Neck ( $53.8 \pm 5.11$ ). The carcass characteristics in Naked Neck, Rhode Island Red, Fayoumi and Australorp recorded in 10-week-old chicken reared in deep litter system does not showed any significant ( $P > 0.05$ ) differences in this current research trial. Same pattern of findings was found by Lariviere *et al.*, 2009 at 85 days of age of chicken.

#### Comparative health status

Mortality is a significant indicator of poor management and welfare. Improvements in managemental practices are necessary to decrease mortality rates among the poultry (Blokhuys *et al.*, 2006). In this research study Naked Neck had lowest mortality and morbidity rate followed by Fayoumi and Australorp while Rhode Island Red had the highest morbidity and mortality rate as compared to all three breeds, same results were also demonstrated by Khawaja *et al.*, 2012 who demonstrated Desi and Fayoumi breeds have low mortality rates than Rhode Island Red. Farooq *et al.*, 2002 who observed the mortality rates in indigenous breeds in Charsadda, Pakistan, is 24.1% for the day old birds, 18.7% in the pullet and 28.1% in the adult, whereas the complete rates of mortality of the entire flock were 23.6%. The results in current research showed that mortality was recorded in Australorp (2%) is low under intensive system, same findings were also reported by Gondwe and Wollny, 2003 who reported mortality in Australorp on the system of free-range in rural areas. These findings show that Australorp is less adaptive to the rural environmental conditions and needs good husbandry and managemental practices. High mortality rate was found in Rhode Island Red (3%) during the entire period, similar high mortality rates in Rhode Island Red (18.9%) was reported by Halima *et*

*al.*, 2006 under semi intensive management in North West Ethiopia. Higher mortality rate was observed during entire research period. Improvements in managemental practices are necessary to decrease mortality rates between birds

#### CONCLUSION:

Based on current research results it was concluded that Australorp and breeds had improved body weight, Feed conversion ratios and carcass traits which is linked with good managemental practices, therefore, a well-planned Housing and Managemental approach is mandatory to make indigenous poultry breeding and farming a money-making small-scale entrepreneurship. While Naked Neck breed had low mortality rate with high disease resistibility with diseases and better adaptability with local environmental conditions and carcass weight is comparatively lowest in this breed. Rhode Island Red presented poor performance regarding health status and local environment adaptability as compared to others. It is further recommended that by increasing CP% in feed formulation can help chicks gain more weight with low feed consumption and better feed conversion ratio. There is a need to further investigate the immunity and mechanism of better feed efficiency in various breeds at different stages of life in local conditions of Pakistan.

#### Authors Contributions

Conducted and designed experiments: Muhammad Naeem Jan & Nasir Rajput, performed experiments: Muhammad Naeem Jan, Waja Irfan and Rahat Abbas, Analyzed data: Muhammad Naeem Jan, and Muhammad Naeem, Contributed materials/ analysis/ tools: Muhammad Naeem Jan & Nasir Rajput, Wrote paper: Muhammad Naeem Jan.

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