

Comparison and crossbreeding effects on quantitative phenotypic traits and mortality rates of two local chicken breeds under free range and intensive management conditions

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Abstract

Present study was undertaken to evaluate the biochemical composition including CBC and phenotypic traits obtained from cross breeding of Desi and Fayoumi chickens. Samples were collected from local peoples and hatcheries of district Kashmore and transported to intensive care management system at animal house department of zoology Shah Abdul Latif University Khairpur, mirs. Both chickens' populations were reared and F1 generation chickens were obtained by recommended cross formula. The phenotypic traits like comb lengths and beak sizes were noted high in such sequences as Desi>Desi F1>Fayoumi F1>Fayoumi chickens in different stages of growth. Mortality rates were observed high in Fayoumi breed as compared to Desi breed during both sessions, while in winter Fayoumi death rates were in highest in winter due to pulmonary infections. Health protocols like vaccination and immune boosters were introduced to flocks under guidance's of local veterinary officials. Feeding and rearing procedures were followed by NRC and ISA recommended guidelines.

Key Words: Chickens, Phenotype, Genetic traits, Cross breeding

INTRODUCTION

Most of developing countries are facing fierce scarcity of animal protein including Pakistan with gap of approximately (10 g) in per capita availability. This scarcity is high in denser rural areas which covers major part of the population. In this context very rapid source of the protein is only poultry chicken's production. The production capability of *Desi* (domestic) chicken, which is

used as an important and cheap supply of required protein diet in rural areas, due to its slow growth may not fulfill the demands of local consumers (Halima, H., Naser, F.W.C., 2007).

The increasing demand for production of *Desi* (domestic) chickens is due to self-caring, least investment and also useful for degradation of environmental hazards and harmful wastes. Most of local consumers have positive perception that the meat and *desi* chicken's products are much better than the poultry chickens. In spite of that the poultry industries of chickens has immersed rapidly during the last three decades. The supply of commercial poultry yields in rural areas is much low as compare to urban areas. Pakistan still lying below in list of per capita production in poultry food stuffs and chicken meat as compared to other countries on globe is showing national health status (Farooq, M., Shakir, M.K., et.al., 2004).

An environmental adaptation and survival ability makes local breeds as indicator for successive poultry production in harsh ecological niches of the world. In different parts of world including Pakistan having native chicken breeds that gives a prior population for better production and diversification. Thus production capability of native breeds can be enhanced genetically to attain great profitability and meat production of rural birds. There are some important local traits having much better competence in many aspects of poultry products like egg laying, egg weight and fast expansion rate that can be helpful for economic effectiveness of rural poultries (Brisbin Jr, I.L. and Peterson, A.T., 2007). Under the rural condition chances of survival for chickens become much more difficult due the climatic changes, their growing and breeding rate enhanced in rural condition. However, cross breeds between different types of chickens carried out under rigorous and improved environmental conditions. For rapid trait production of different breeds may be crossed and will result in various perfections such as increase in their population, efficient sustainability in respect of harsh ecological conditions, and increase in meat production and will contribute great part of income for local farmers (Fentie, T., Abebe, B. and Kassa, T., 2013).

Present study has great importance in field of meat and meat products in local areas of Sindh. It has good impact on human health while producing new species through cross breeding of domestic and *Fayoumi* chickens. Development of new method will be useful for farmers that meet present scarce conditions of our country. The possible outcomes of research will be helpful in reducing many epidemic diseases in chickens.

MATERIAL AND METHODS

Sampling site and collection

Kashmore district has a significant place in Sindh province due to its geographical status, the borders of district touches with Punjab and Baluchistan provinces. The geographical status of study area is between (28° 28' N 69° 32'E) and lying at North of the Indus River having an important economic and commercial role for its local people. A collection of 30 chickens of each variety as un-sexed about 90 days old both male and female with the ratio of 1:4 as male and female were obtained from local peoples and hatchery of Kashmore. The flock of both varieties was placed in animal house in department of Zoology Shah Abdul Latif University Khairpur. A deep litter system was maintained for required period. Both varieties were crossed and obtained F1 generation chicks successfully.

Rearing under FRC

Desi and *Fayoumi* chickens were reared in free range conditions and arrangements were as in rural domesticated habitat. In these conditions proper feeding and vaccinations were not much introduced, chickens use to feed household wastes and used crops and vegetable fields as fulfill their dietary needs.

Rearing under IMC

The both chicken varieties were reared separately in different bird cages respected to their average population. Feeding system and water availability was arranged according to NRC and ISA guidelines. Whole chickens population was vaccinated according to the vaccination schedule given by regional vaccinating authorities (Dutta, R.K., Islam, M.S. and Kabir, M.A., 2013).

Cross breeding formula

Desi male 0*Fayoumi* female F1 generation of *fayoumi* chickens

Fayoumi male *Desi* female F1 generation of *Desi* chickens

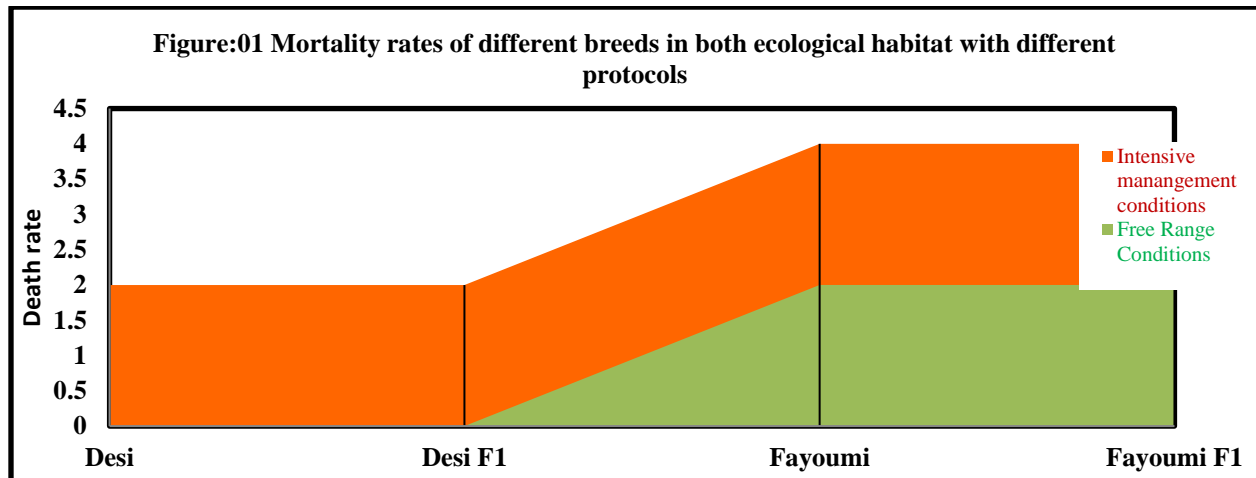
Quantitative measurements

Quantitative measurements of linear traits and body weight were taken on sampled both *desi* and *fayoumi* chickens of both sexes using a textile measuring tape (cm) and electronic balance (grams). Body height (BH) The body height was measured using a sawing tape having the bird stand at a horizontal position from the feet stage. Shank length (SL) Shank length was measured as distance from the shank joint to the extremity of the digitus pedis. Beak length (BkL) this was measured from the brooder end of the beak (towards the head) to its pointed end. Wing span extended from the junction of humors to the spine to tip of wing was measured. Neck length was measured distance from base of the head to starting point of thorax of the two mandibles.

Table: 01 shows the quantitative parameters of both chicken varieties in different ecological conditions following similar feeding protocols.

Habitat	Chicken breeds		Neck Length (cm)	Body Height (cm)	Shank Length (cm)	Beak Length (cm)	Wing Span (cm)
Intensive conditions	<i>Desi</i>	Male	20.4±1.9	43.4±3.2	12.5±0.82	3.6±0.21	23.7±1.6
		Female	15.3±1.4	37.8±2.4	10.3±0.68	3.2±0.17	20.3±1.4
	<i>Desi</i> F1	Male	19.3±1.6	38.1±3.4	10.2±0.87	3.3±0.21	21.3±1.9
		Female	13.5±1.4	34.5±3.1	8.7±0.65	3.2±0.18	18.4±1.6
	<i>Fayoumi</i>	Male	16.5±1.4	33.7±3.2	8.3±0.72	2.7±0.16	18.3±1.5
		Female	15.2±1.4	32.4±2.8	7.8±0.64	2.4±0.16	17.4±1.6
	<i>Fayoumi</i> F1	Male	17.4±1.6	34.2±2.8	8.6±0.72	2.9±0.17	19.4±1.7
		Female	16.7±1.4	33.7±2.7	8.3±0.75	2.8±0.18	18.7±1.6
Free range conditions	<i>Desi</i>	Male	18.7±1.6	38.7±3.2	10.3±0.97	3.3±0.24	20.4±1.5
		Female	15.3±1.2	35.2±3.1	8.7±0.92	3.1±0.25	19.7±1.07
	<i>Desi</i> F1	Male	18.2±1.5	38.5±3.3	10.2±0.94	3.2±0.23	20.2±1.6
		Female	15.3±1.3	35.4±3.1	8.6±0.87	3.1±0.21	19.6±1.5
	<i>Fayoumi</i>	Male	16.4±1.3	34.6±3.1	9.4±0.94	2.7±0.18	18.5±1.4
		Female	12.7±1.2	32.5±2.8	9.2±0.82	2.4±0.18	18.2±1.4
	<i>Fayoumi</i> F1	Male	17.8±1.4	36.1±3.1	9.8±0.83	2.8±0.16	19.3±1.5
		Female	13.2±1.2	35.4±2.9	9.5±0.87	2.3±0.16	18.7±1.3

Figure: 01 Mortality rates of different breeds in both ecological habitats with different protocols



Discussion

Intensive Management Conditions

Table: 01 shows the quantitative parameters of both chicken varieties in intensive management conditions as well as free range conditions managed in Kashmir district. It includes both *Desi* and *fayoumi* 90 days old pullets of pure breed and were placed in intensive conditions and same age and breeds were placed in free range domestic conditions. Population was arranged as male and female chickens with ratio of 3:1 for proper breeding colony. *Desi* Male rooster with neck length of 20.4 ± 1.9 cm and female 15.3 ± 1.4 cm. Body height of *desi* male 43.4 ± 3.2 cm and female *desi* had 37.8 ± 2.4 cm, Shank length about 12.5 ± 0.82 cm and female with 10.3 ± 0.68 cm, Beak length of *desi* rooster with 3.6 ± 0.21 cm and female *desi* chicken with 3.2 ± 0.17 cm and wing span was noted as 23.7 ± 1.6 cm, whereas female *desi* chickens average wing span was recorded as 20.3 ± 1.4 cm.

After cross breeding of parents F1 generation outcomes were obtained and male *desi* chicken neck length was 19.3 ± 1.6 cm and female F1 *desi* neck length was 13.5 ± 1.4 cm, body height of male 34.5 ± 3.1 cm, female 13.5 ± 1.4 cm. The shank length of *desi* F1 rooster was found 10.2 ± 0.87 cm for male, and female with 8.7 ± 0.65 cm. The Beak length was noted as 3.3 ± 0.21 cm for female, and female with 3.2 ± 0.18 cm and wing span was noted as 21.3 ± 1.9 cm for male, whereas female with 18.4 ± 1.6 cm. Fayoumi chicken breeds were introduced in intensive care

managed at kashmore in which samples having 90 days old rooster parents male *fayoumi* had average neck length 16.5 ± 1.4 cm, female had 15.2 ± 1.4 cm, Body height of male 33.7 ± 3.2 cm, female *fayoumi* chicken 32.4 ± 2.8 cm. Shank length of male 8.3 ± 0.72 cm, female 7.8 ± 0.64 , Fayoumi beak length of male 7.8 ± 0.64 cm female 2.4 ± 0.16 . Wing span of rooster 18.3 ± 1.5 and female 17.4 ± 1.6 cm.

After cross breeding F1 *fayoumi* chickens were obtained had neck length of male rooster as 17.4 ± 1.6 cm, female 16.7 ± 1.4 cm, and body height of male *fayoumi* 34.2 ± 2.8 cm female 33.7 ± 2.7 cm. Shank length of male as 8.6 ± 0.72 cm, female *fayoumi* chicken had 8.3 ± 0.75 cm, Beak length of male 2.9 ± 0.17 cm, female 2.8 ± 0.18 cm, wing span of male with 19.4 ± 1.7 cm, female 18.7 ± 1.6 cm.

Free range domestic conditions

Desi male rooster with neck length of 18.7 ± 1.6 cm and female 15.3 ± 1.2 cm Body height of *desi* male 38.7 ± 3.2 cm and female *desi* had 35.2 ± 3.1 cm Shank length about 10.3 ± 0.97 cm and female with 8.7 ± 0.92 cm Beak length of *desi* rooster with 3.3 ± 0.24 cm and female *desi* chicken with 3.1 ± 0.25 cm and wing span was noted as 20.4 ± 1.6 cm whereas female *desi* chickens average wing span was recorded as 19.7 ± 1.07 cm

After cross breeding of parents F1 generation outcomes were obtained and male *desi* chicken neck length was 18.2 ± 1.5 cm and female F1 *desi* neck length was 15.3 ± 1.3 cm, body height of male 38.5 ± 3.3 cm, female 35.4 ± 3.1 cm, The shank length of *desi* F1 rooster was found 10.2 ± 0.94 cm for male, and female with 8.6 ± 0.87 cm. The Beak length was noted as 3.2 ± 0.2 cm for male, and female with 3.1 ± 0.21 cm and wing span was noted as 20.2 ± 1.6 cm for male, whereas female with 19.6 ± 1.5 cm. Fayoumi chicken breeds were introduced in intensive care managed at kashmore in which samples having 90 days old rooster parents male *fayoumi* had average neck length 16.4 ± 1.3 cm, female had 12.7 ± 1.2 cm, Body height of male 34.6 ± 3.1 cm, female *fayoumi* chicken 32.5 ± 2.8 cm, Shank length of male 9.4 ± 0.94 cm, female 9.2 ± 0.82 cm, *Fayoumi* beak length of male 2.7 ± 0.18 cm female 2.4 ± 0.18 cm. Wing span of rooster 18.5 ± 1.4 cm and female 18.2 ± 1.4 cm.

After cross breeding F1 *fayoumi* chickens were obtained had neck length of male rooster as 17.8 ± 1.4 cm, female 13.2 ± 1.2 cm, and body height of male *fayoumi* 36.1 ± 3.1 cm female 35.4 ± 2.9 cm. Shank length of male as 9.8 ± 0.83 cm, female *fayoumi* chicken had 9.5 ± 0.87 cm, Beak length of male 2.8 ± 0.16 cm female 2.3 ± 0.16 cm, wing span of male with 19.3 ± 1.5 cm, female 18.7 ± 1.3 cm.

Conclusion

Meanwhile it was concluded that all parameters were found greater in breeds sequences as *Desi*>*Desi F1*>*Fayoumi F1*>*Fayoumi* chickens in different stages of growth. In that context values of all parameters were found greater in breeds sequences as *Desi*>*Desi F1*>*Fayoumi F1*>*Fayoumi* chickens in different stages of growth. Mortality rates were observed high in *Fayoumi* breed as compared to *Desi* breed during both sessions, while in winter *Fayoumi* death rates were in highest ratio in due to pulmonary infections Mortality rates were observed high in *Fayoumi* breed as compared to *Desi* breed during both sessions, while in winter *Fayoumi* death rates were in highest ratio in due to pulmonary infections to while in winter *Fayoumi* death rates were in highest ratio in due pulmonary infections.

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Conflicts

No any conflict of interest was reported by author.

REFERENCES

1. Besbes, B., 2009. Genotype evaluation and breeding of poultry for performance under sub-optimal village conditions. *World's Poultry Science Journal*, 65(2), pp.260-271.
2. Brisbin Jr, I.L. and Peterson, A.T., 2007. Playing chicken with red junglefowl: identifying phenotypic markers of genetic purity in *Gallus gallus*. *Animal Conservation*, 10(4), pp.429-435.

3. Charrondiere, U.R., Chevassus-Agnes, S., Marroni, S. and Burlingame, B., 2004. Impact of different macronutrient definitions and energy conversion factors on energy supply estimations. *Journal of food composition and analysis*, 17(3-4), pp.339-360.
4. Dolberg, F., 2003. *A Review of Household Poultry Production as a Tool in Poverty Reduction with Focus on Bangladesh and India* (No. 855-2016-56226).
5. Dutta, R.K., Islam, M.S. and Kabir, M.A., 2013. Production performance of indigenous chicken (*Gallus domesticus* L.) in some selected areas of Rajshahi, Bangladesh. *Journal of Experimental Agriculture International*, pp.308-323.
6. England, P.R., Cornuet, J.M., Berthier, P., Tallmon, D.A. and Luikart, G., 2006. Estimating effective population size from linkage disequilibrium: severe bias in small samples. *Conservation Genetics*, 7(2), p.303.
7. Farooq, M., Shakir, M.K., Mian, M.A., Mussawar, S., Durrani, F.R. and Cheema, A., 2004. Status of backyard chicken reared by women in Chitral [Pakistan]. *Pakistan Veterinary Journal (Pakistan)*.
8. Fentie, T., Abebe, B. and Kassa, T., 2013. Small-scale family poultry production in north Gondar: characteristics, productivity and constraints. *Livestock Research for Rural Development*, 25(9).
9. Fulton, J.E., Berres, M.E., Kantanen, J. and Honkatukia, M., 2017. MHC-B variability within the Finnish Landrace chicken conservation program. *Poultry science*, 96(9), pp.3026-3030.
10. Halima, H., Nesor, F.W.C., van Marle-Koster, E. and De Kock, A., 2007. Phenotypic variation of native chicken populations in northwest Ethiopia. *Tropical animal health and production*, 39(7), pp.507-513.
11. Hill, W.G. and Zhang, X.S., 2004. Effects on phenotypic variability of directional selection arising through genetic differences in residual variability. *Genetics Research*, 83(2), pp.121-132.

12. Hill, W.G., 2002, August. Direct effects of selection on phenotypic variability of quantitative traits. In *Proc. 7th World Cong. Genet. Appl. Livest. Prod., Montpellier* (pp. 19-23).
13. Eriksson, J., Larson, G., Gunnarsson, U., Bed'Hom, B., Tixier-Boichard, M., Strömstedt, L., Wright, D., Jungerius, A., Vereijken, A., Randi, E. and Jensen, P., 2008. Identification of the yellow skin gene reveals a hybrid origin of the domestic chicken. *PLoS Genet*, 4(2), p.e1000010.