



RESEARCH PAPER

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Comparative Studies of Different Biochemical Parameters in various organs of *Gallus gallus domesticus* of Khairpur, Sindh, Pakistan

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Abstract

Present study was undertaken to evaluate the biochemical composition in different body parts of *Gallus gallus domesticus*. Samples were collected from two sites of Khairpur city and its surroundings for assessment of various biochemical parameters such as protein, fat, moisture and ash contents in different parts like intestine, heart, gizzard, lung, kidney, liver and muscle. The slaughtered chickens of uniform sizes were transported for further processes to Institute of Chemistry Lab, Shah Abdul Latif University, Khairpur. After this dissection, digestion and analysis was performed by the help of different methods and instrumentation. It was observed that all investigated parameters found high in main city sampling site as compared to samples collected from surroundings of city. Although the protein contents were found high in both sampling sites main city and its surroundings, as muscle contains (0.68, 0.61 μg^{-1}), gizzards (0.64, 0.58 μg^{-1}), heart (0.61, 0.55 μg^{-1}), intestine (0.53, 0.46 μg^{-1}), kidneys (0.45, 0.43 μg^{-1}), lungs (0.40, 0.38 μg^{-1}) and liver has (0.34, 0.35 μg^{-1}). The percentage of fat accumulation followed by gizzards<kidneys<muscle<liver<intestines<heart<lungs. However no significant difference was noted in percentage of moisture and ash contents in all organs of chicken samples possibly due to equal quantity of (WAI) of chicken body.

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Introduction

Chickens farming are the wealthiest and cheap food item these days. This is due to the superior taste, good quality and easy availability at cheap price compared to fish and red meat. Chickens are considered to be one of the best sources of proteins for the human body. The caloric content with fulfilling nutritional content makes it the best contender in the edible market. The exaggerated consumption of chicken has encouraged farmers and the business sector at large to breed and rear more chickens, aiding in the construction of new and well-equipped poultry farms. These farms use broilers for meat production and layers for solely egg production. It is documented that chickens generally take more than three months to grow to a size fit for human consumption. At the end of three months they usually attain the weight of more than or equal to 1.5kg. This duration is considerably long and needs to be shortened to fulfill the chicken requirement of the masses. For that reason specialized poultry feed is introduced in the market to enhance poultry growth in shorter time periods.⁴ Poultry feeds are essentially of two types (Fulton, J.E., Berres, M.E., *et al.*, 2017). The one for the broilers contains predominantly proteins and fats to ensure the growth and rapid weight-gain of the chickens. On the other hand, the layer hens are fed upon feeds that are rich in calcium content.

This calcium-enriched feed helps maintain the calcium content constant in the body which is necessary for the development of eggs. The conventional broilers are fed on commercial feeds while the organic ones are fed on the natural grains and grit and are allowed to roam free. These organic chickens consume grains and water *ad libitum* and subsequently excursion on the vast ranges help digest and utilize energy from them in a healthy manner. For this reason the meat content and the nutritional values of both the chickens are extensively different from each other. Consequently a sequential cycle is designed by producing commercial feed, its provision to the broilers to enhance their weight-gain as well as growth and then consumption by the population. The current study was planned to evaluate the contents and the nutritional values of chicken feed, to compare

commercial chicken meat with organic chicken meat, and then to assess their health benefits on humans (U. R Charrondiere *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 (Fentie and Abebe, 2002). 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 (Itoh and Suzuki, 2008).

The progress by crossbreeding is more effective and quicker as compare by variation in selection of production traits, through cross breeding of effective traits that produces superior crosses which will have better productive and reproductive performance (Hill and Zhang, 2004). Poultry, the fastest converter of crude nutrients into high quality of animal proteins, offers a rapid way to overcome Pakistan's shortage of protein of animal origin. From the start of poultry industry in Pakistan, a number of exotic strains have been imported mainly from the temperate countries.

Introduction of these high yielding exotic germ-plasm have contributed significantly in the progress of this sector. In order to enhance the rural poultry egg and meat production, it is desirable to develop breeds with better egg & meat production and suitable to the local environment. Selection, development and conservation of indigenous poultry breeds and hybridizing with high producing exotic breeds will help us to develop high producing dual purpose breed for rural areas. These hybridized local genetic resources can be further utilized to develop our own dual purpose rural chickens, adjustable to the local environmental conditions (M. Farooq, K. Shoukat *et al.*, 2000).

Material and methods

Description of Study Area

The district Khairpur is located in east by India south by Indus River and density is round about 0.952km² whereas it is situated between 27°31'48"N and 68°44'23"E. it is subtropical region usually cold in winter and hot in summer, it lies in northern Sindh. The temperature varies from 4 to 49°C having more than 250mm mean rainfall.

Sample Collection and Dissection

Samples of chickens were taken from Khairpur city and its surroundings. Chicken samples of uniform size were collected in order to avoid the possible error due to size difference among the samples. The samples were placed immediately in polyethylene bags after slaughtering from professional slaughters and were kept into isolated container of ice box and were transported to laboratory of Institute of Chemistry, Shah Abdul Latif University, Khairpur on the same day for further process. The chicken samples were sort out in order to examine below parameters in various specimens after complete dissection of chickens.

1. Protein contents
2. % of Fat
3. % of Moister
4. % of Ash

Sample Preparation and Analysis of Proteins

5 grams of each sample of Domestic chicken were dried, grinded and weighed exactly on chemical balance, weighed samples were transferred into 100mL de-ionized water and dissolved and filtered. 1mL of filtrate was taken into test tube and 4mL of Biuret reagent and 1mL of double distilled water were added. In the same way blank was prepared in which 4mL biuret reagent and 1mL of de-ionized water were added. Contents were kept for twenty minutes for both sample as well as blank. Standards were prepared by BSA for calibration purpose. The readings were taken at 540nm using Double Beam Spectrophotometer and concentration of Protein was found from calibration graph.

Determination of Fat Content

The empty beakers were dried in the oven at 105°C for 3h and transferred these into Desiccators for cooling. The empty beakers were weight separately and initial weight was noted. Then 01g of aqueous chicken sample was taken in separating funnel and 60mL of Petroleum ether was added. The sample was vibrated for 20 minutes for separation.

When two immiscible layers were obtained than aqueous layer was discarded. The solvent layer was received in pre-weight beaker and it kept in oven for gentle heating. When solvent was completely evaporated then the sample was weighed with beaker and final reading was noted.

Determination of Moisture Content

The empty watch glasses were dried in the oven at 105°C for 3 h and transferred these into Desiccators for cooling. The empty watch glasses were weight separately and initial weight was noted. The 03 g of sample was weight for both Broiler and domestic chicken in watch glass. Spread the sample to the watch glass with uniformity.

The Watch glasses with samples were kept in the oven. The samples were dried for an hour at 105°C and the first reading was noted. Again samples were kept in oven for heating to remove moister. Until and unless constant weight was noted the sample were heated continuously. When constant weight was recorded than watch glasses were kept in desiccators for cooling. The watch glasses were reweighed with its dried sample.

Determination of Ash Contents

To destroy impurities at the crucible surface, crucibles were placed in the oven the temperature of about 300°C for the night. The desiccators were used for cooling purpose of crucibles. The crucible weight 03 decimal places. The 5g of each organ of both chicken varieties was weighed in the crucible.

The crucible were Heated completely at 300°C all night. The samples were cooled down in the Desiccators. The final Weight was noted for both types of samples ash with crucible.

Results and discussion

Table 1. Aggregate value of different parameters in various organs of *Gallus gallus domesticus* from Khairpur main city.

SN	Samples	Protein (μg^{-1})	Fat (%)	Ash (%)	Moisture (%)	STDV	%RSD
1	Gizzard	0.58	1.6	19.3	75	0.21	2.4
2	Heart	0.55	0.8	18.1	72	0.14	2.1
3	Intestine	0.46	0.9	19.4	69	0.18	1.9
4	Kidney	0.43	1.4	9.4	73	0.13	1.6
5	Lungs	0.38	0.4	15.6	62	0.18	1.6
6	Liver	0.34	1.0	12.3	70	0.20	1.7
7	Muscle	0.61	1.3	16.7	72	0.16	7.8

Poultry is considered to be one of the chief sources of protein for people of Pakistan. The increase in demand of the chicken meat has led to the formation of more chicken farms and pens to hold more and more chickens for rearing purpose and to meet the demand for chicken supply.

Certain non-nutritional additives were found as toxicities in the feed fed to commercial chicken that can be hypothesized to concentrate in their chicken flesh and may exert deleterious effects on the health of human consumers. It is imperative to remove these additives in commercial feed and promote organic chicken consumption that is bred on whole grains without any supplementation of additives. Table 1 shows the maximum concentration of protein contents in muscle and minimum was in liver of investigated samples. The decreasing order was noted as muscle>gizzard>heart>intestine>kidney>lungs>liver. Whereas in case of total fat the highest values were noted in gizzards of chickens and its lowest values were in heart samples. The decreasing order of fat contents was shown as gizzard>kidney>muscle>liver>intestine>heart>lungs. Although peak level of ash contents were found in intestines and moisture was extracted at high concentration in gizzards of city samples of chickens.

The total fats in the chickens incorporate all types of fats including saturated, monounsaturated and polyunsaturated fats as well as cholesterol. These fats were observed to be significantly raised in the chicken skinless and boneless meat. The total fats may be the reason of high caloric content of the local chicken

meat. The health concerns of the increased fatty acids may also be considered while consuming commercial chicken meat. These concerns increase in the causation of the cardiovascular disorders (CVD) including atherosclerosis, plaque construction in blood vessels and raised blood pressure. Table 2 indicate the concentration of various biochemical parameters in various organs of samples collected from surrounding area of khairpur, mirs. The highest level of protein contents was noted in gizzards and lowest values were observed liver of analyzed samples. In case of total fat intestine showed maximum value in respect of other organs. As mentioned in above percentage of ash was noted high intestine of samples, whereas highest level of moisture contents was observed gizzards as compare to different analyzed organs.

Table 2. Aggregate values of different parameters in various organs of *Gallus gallus domesticus* from surrounding areas.

SN	Samples	Protein (μg^{-1})	Fat (%)	Ash (%)	Moisture (%)	STDV	%RSD
1	Gizzard	0.64	1.6	18.1	73	0.23	2.4
2	Heart	0.61	0.7	15.2	70	0.12	2.1
3	Intestine	0.53	0.8	19.8	67	0.15	1.9
4	Kidney	0.45	1.3	9.6	71	0.15	4.8
5	Lungs	0.40	0.6	12.3	64	0.23	2.9
6	Liver	0.35	1.0	14.3	67	0.21	2.7
7	Muscle	0.68	1.2	17.5	72	0.17	2.1

Conclusion

The highest level of protein contents were observed in muscles and gizzards of both sampling sites as city and its surroundings, whereas percentage of fat was found high in gizzards of both sampling areas. The values of ash and moisture show relatively negligible differences among different organs of collected samples. However all biochemical parameters showed healthy correlation among each species and within recommended limits.

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Conflicts

No potential conflict of interest was reported by authors.

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