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Response of wistar rats to broiler chicken feed and soy bean on body weight, obesity and weight of selected visceral organs

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Abstract: Chicken meat is the most favorite consumable commodity current days. The high demand for the chicken meat is fulfilled through the poultry farms working day and night feeding the chicken feed as a major entity for the early growth and weight gain of the chickens. The aim of the present study was investigate effects of the commercially available chicken feed and raw soy beans on body weight gain, obesity and weight of the specific visceral organs in rats. Seventy five female albino wistar rats were used in the experiment. Animals were randomly assigned to two groups (n=25), control rats fed on standard rodent chow, chicken feed treated rats and raw soy treated rats for a period of 6 weeks. Body weight was estimated before and after the treatment. Constituents of chicken feed were analyzed through Pakistan council of scientific and industrial research (PCSIR) laboratories. The present study showed that the weight gain, obesity and growth performance of the feed treated group rose significantly as compared to control group and soy treated group. It was therefore, concluded that the constituents of chicken feed are the reason of increased weight gain, better growth performance, obesity and increase in the weight of the visceral organs. It is therefore suggested that the potential increase in obesity in general population is due to increased levels of fats present in the diet which may lead to weight gain and obesity which may be the consequence from dietary preference of people at the present time more towards chicken products.

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INTRODUCTION

Chicken consumption has increased tremendously these days exceeding the consumption of red meat and vegetables despite of the fact that development of the modern broiler has occurred more than 100 years ago[1]. The chicken's adaptability has permitted it to be grown worldwide under a wide range of husbandry environments. Chicken supply in wide range of environments is grown rapidly with speedy growth to market weight with the efficiency of feed use[2]. In last two decades at 35 days a broiler require3.22 kg of feed to yield 1.40 kg of weight. Under superior husbandry and a high-energy diet now a 2.44-kg broiler produced on 3.66 kg of feed[3]. This analysis endeavors to concentrate on the olden times of factors causative to these changes, hindrances that have had to be overcome, and future limitations[4]. The main purpose of poultry industry is to augment the carcass yield with better taste and texture of meat. The increase in poultry meat utilization has directed the process of fast-growing broilers with consumption of commercially available feed[5]. Intensive assortment of feed has led to great improvements in economic traits such as body weight gain and breast yield to meet the demands of consumers. To facilitate the production of lean meat, different feeding strategies for poultry production[6]. Poultry feeds are composed principally of combination of a number of feedstuffs such as cereal grains, soybeans, animal by-product, fats, mineral premixes and vitamin[3]. Feed together with water provides energy and nutrient essential for growth, reproduction and health of the chickens. The energy needed for preserving poultry general metabolism and meat and eggs production is provided by the energy-yielding dietary components, mainly carbohydrates and fats, but also protein[7]. The most suitable technique of feeding chickens is with a balanced pelleted allowance as fats, carbohydrates and proteins explain for the major cost of poultry diets, these components are determined from beginning to end the accurate diet formulations and chemical analysis of feed[8]. It is found that in soybeans, corn, maize cereal grains make the supplemented with animal fat, poultry remains, blood, fish, bones to chicken feed[9]. Research shows that soya bean from legume family itself is considered a complete diet on the basis of the presence of carbohydrates, fats and more prominently proteins with factually containing almost all essential amino acids in it[10]. Soybean meal is a significant and cheap source of protein for animal feeds and many prepackaged meals, soybean products as textured vegetable protein are ingredients in many meat and dairy analogues[11]. Together, soybean oil and protein content account for about 60% of dry soybeans by weight (protein at 40% and oil at 20%) with 35% carbohydrate and about 5% ash[12]. Soybeans are considered to be a source of complete protein with the significant amounts of all the essential amino acids that must be provided to the body because of the body's inability to synthesize them[13]. Soybeans and soy products contain significant amounts of purines, a class of organic compounds[13]. All the characteristic components in soya bean and their functions make it a complete and balanced diet for humans and also for the animal

husbandry especially poultry[12]. Meta-analysis on the effects of soy protein intake on serum lipids has shown that that soy protein is correlated with significant decreases in serum cholesterol, LDL (bad cholesterol) and triglycerides[14]. However, HDL (good cholesterol) did not increase by a significant amount[14]. Soy phytoestrogens (isoflavones: genistein and daidzein) adsorbed onto the soy protein were suggested as the agent reducing serum cholesterol levels resulting in approval by the Food and Drug Administration's (FDA) as an certified cholesterol-lowering food, besides other heart and health benefits mainly enhancing memory and cognitive functions in elderly[13,14].

MATERIALS AND METHODS

Total 75 female albino wistar rats (90-110g) were taken and divided into three groups. Group one was labeled control group and given with standard rat chow, group two was treated with chicken feed and group three with raw soybeans for a period of six weeks. The rats were kept for 12 hr day and night cycle with ambient room temperature of 22±2ºC at the animal house of Baqai Medical University, Karachi. Base line body weight of rats of the groups was taken. At the end of the experiment final body weight was measured with estimation of obesity in rats by the presence of the fat pads around the abdomen. The rats were dissected through the midline incision and weight of visceral organ liver calculated.

Data was analyzed by one-way ANOVA. Individual comparison were made by Tukeys HSD test; p values <0.01 were considered significant.

RESULTS

Table 1 shows the food components of the chicken feed available commercially for chickens. Table 2 shows the effect of chicken feed and raw soy proteins on body weight in rats. Data analyzed by one way ANOVA revealed a significant effect of chicken feed on weight gain in rats (F=16975.8, df: 2,72, p<0.01). Post hoc analysis by tukeys HSD test showed that weight gain was significantly increased following oral intake of chicken feed for 6 weeks as compared to rats treated with raw soy and controls. The weight gain with soybean treated rats remained almost same as control rats.

Table 3 shows obesity in rats fed on rat chow, chicken feed and soybeans. Data analyzed by one way ANOVA showed significant outcome on obesity in rats (F=1693.8, df=2,72 , p<0.01). Post hoc analysis by tukeys HSD test showed that obesity was significantly increased of rats fed on chicken feed for 6weeks than soybean treated and control rats.

Table 4 shows weight of livers of rats fed on chow, chicken feed and soybean. Data analyzed by one way ANOVA showed significant effect on weight gain of livers in rats fed with rat feed than control rats and soybean fed rats (F= 1419.3, df=2,72 , p<0.01) (F=1693.8 , df=2,72 , p<0.01). Post hoc analysis by tukeys HSD test showed that weight of livers was significantly increased of rats fed on chicken feed for 6weeks than soybean treated and control rats.

Table 1: Food components of commercially available chicken feed.

• Wheat and sorghum
• Maize
• Soybean
• Rice and maize bran
• Animal fats
• Animal meat
• Animal bone
• Bone marrow
• Fish
• Crystalline amino acids
• Mineral and vitamin supplements

Table 2: Final gain in body weight of control rats, chicken feed treated rats and soybean treated rats.

Body weight	Control Group fed on rat chow	Chicken feed treated rats	Soybean treated rats
Initial (g)	99.0±5.0	99.8±4.1	98.9±5.7
Final (g)	221.1±5.4	229.7±4.3*	212.6±5.9*+
Gain (g)	122.1±0.4	129.9±0.3*	113.7±0.2*+

Values are mean±SD. Significant difference by tukeys HSD test; *P<0.01 vs control group fed with rat chow; + P<0.01 vs chicken feed treated rats.

Table 3: Obesity in rats.

	Control Group fed on rat chow	Chicken feed treated rats	Soybean treated rats
Obesity	2.7±0.46	13.0±1.3*	1.0±0.13*+

Values are mean±SD (n=25). Significance difference by tukeys HSD test; *P<0.01 vs the control group. Figures with + sign in the test group are significantly (P<0.01) different from the other test group.

Table 4: Weight of livers and obesity in rats.

	Control Group fed on rat chow	Chicken feed treated rats	Soybean treated rats
Weight of liver	7.0±0.31	10.9±0.30*	6.0±0.41*+

Values are mean±SD (n=25). Significance difference by tukeys HSD test; *P<0.01 vs the control group. Figures with + sign in the test group are significantly (P<0.01) different from the other test group.

DISCUSSION

It has been studied previously that currently more preference towards the chicken meat consumption has led increased utilization of the chicken feed for the better growth and weight gain of

poultry[15]. It has been seen that chicken feed contains proper rations of the basic ingredients and formed in pellets to provide proper and complete portion of diet to chickens by less energy expenditure by pellets formation of feed[16]. It is observed in the present study that chicken feed contains portions of cereals namely maize, soybean and corn with certain additives like minerals and vitamins as supplements. It is revealed in this study that animal fats are present in abundance in the feed contributing to cholesterol and fat precursor in the body resulting in the greater weight gain and obesity. Presence of fat pads around abdomen and visceral organs connect to obesity and also contribute to the fact of availability of high energy yielding animal by products and remains in feed[3]. Upon consumption of feed the rats not only gained weight more speedily but also got obese by having thicker adipose fat layers around abdomen and visceral organs. The gain in weight and adiposity also added weight to their livers. Gaining weight of livers of feed fed rats revealed the excess production of proteins and also fats by the liver leading to hypertrophy of liver cells. The livers in return to such diet which is rich in fat and cholesterol precursore and amino acids yield more production of fats, cholesterol and proteins adding to the weight and hypertrophy of the livers.

It is been studied that soybean due to its complete nourishing capabilities is considered as complete diet and is also used for breeding chickens but such chickens do not gain weight in short time as compared to chicken feed fed rats[17]. For the reason the rats fed on only soybean meal showed that the growth and the weight gain of such rats was in accordance to growth and weight gain of control rats. This study has enlightened that a complete diet of soybean can provide the proper amount of the nutrients required for the healthy growth than the supplementation of the animal fats like fats and blood of cattle and chicken remains as they provide excess source of energy leading to obesity and excess weight gain. Present research also shows that the chicken feed is also supplemented with amino acids thus yielding both muscle mass and fats in the rats. The obesity level in the rats was seen with the presence of the adipose tissue around the abdomen and it was found that rats fed on the chicken feed were more obese than rats fed on the chow and soybean establishing that the soybean rats did not develop obesity as compared to rat chow and chicken feed treated rats. This shows that even the standard rat chow can cause obesity to some extent while soybean does not. This in addition highlights the reduced weight of the liver and its healthy appearance as compared to the livers of the chicken feed treated rats that are higher in weight with fatty changes and enlarge in size due to fat and protein being manufactured in them.

It is for that reason feed given to chickens provide energy and calories more than required resulting in brisk growth and development of rats. Like wise soybean containing all basic ingredients in addition to essential amino acids allow normal growth of rats with energy and calories sufficient for the body to meet the needs of growth and development.

CONCLUSIONS

It is concluded from the present study that chicken feed contains excess energy and calories due to addition of especially animal remains and fats resulting in the excess gain on weight of chickens in less time than the normal leading to obesity which is seen in rats in the present study. The increasing weight and hypertrophy of liver is accomplished due to increased production of both proteins and fats when fed on chicken feed is again due to the presence of good amount of fats in terms of animal remains, bone marrow and amino acids in high quantity than in soybean.

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