Chapter-I

Introduction

Since being domesticated, quails (*Coturnix coturnix japonica*) have gained a reputation as game birds. Due to the quick financial returns from commercial quail production, quail farming, and breeding are currently very popular. People in many nations have a high level of acceptance of the meat and eggs of quail. In Europe and Japan, commercial quail farming has primarily been set up for the production of meat and eggs. In China, meat-type quails start to be sold at about 4 weeks old (Minvielle et al., 1999). The Japanese quail's unique traits, such as its quick development that allows it to be sold for consumption at 5–6 weeks of age, its early sexual maturity that results in a short generation gap, its disease resistance, its low capital requirement, its high rate of egg production, and its lower feed and space requirements than domestic poultry have further given the birds an advantage and drawn research attention in recent years (Adeogun and Adeoye, 2004).

Due to characteristics like the short generational gap, low feed consumption, good breeding ability, capacity to have a large number of quails per unit space, low breeding costs, and high resistance to illness, the Japanese quail is being used in commercial production for its meat and eggs. In contrast to meat production, which is significant in Europe, egg production is significant in the Far East and Asia (Karapetyan, 2003). In Bangladesh, the production of meat-type quails is more common than egg-type quail (Rahman et al., 2010).

One of the poultry species with a rapid generational change is the Japanese quail. Farmers, business owners, and researchers are becoming more interested in quail farming, which is used as an alternative method of producing chicken in many countries with regard to fulfill meat/ egg consumption demand. It is employed for research, food, game, and pet needs (Muthukumar et al., 2005). Japanese quails are marketed for meat weighing 200-240g at 4-5 weeks old. Females are typically raised until they are 10 to 12 months old for breeding when they begin to lay eggs at around 6-7 weeks of age. Each female produces 250–270 eggs during this time, measuring 12–13g each (Asha, 2011). The sex of the Japanese quail had an impact on carcass weight, carcass percentage, breast weight, and thigh percentage (Vali et al., 2005). Quail farming is a relatively new species in Bangladesh. There are 131 species of wild quail and 17–18 subspecies worldwide, with the Japanese, Bobwhite, King, and Stable quail being the most prevalent.

Quails are distinguished by their quick development. They can be sold as table birds at five weeks old early sexual maturity (they lay their first egg at 40 days old), a high rate of egg production (up to 250 eggs per year), and short incubation period (16–17 days). They are also notable for their short generation intervals (3–4 generations per year), modest floor area (200–250 and 150–200 cm2 in litter and cage systems, respectively), lower feed needs (20–25 g/adult bird/day).

In Bangladesh, poultry, eggs, and meat account for about 38% of all animal protein. Animal-derived protein consumption in Bangladesh is substantially lower than in other nations of the world. The average annual shortfall of beef is 3.81 million metric tons, while the average annual deficit of chicken eggs is 6939 million numbers (Speedy et al., 2003). Bangladesh's natural surroundings and climate are ideal for raising quail. In this nation, quail can be raised all year round with good results for producing meat and eggs (Kar et al., 2017). Due to quails' early sexual maturity, quick development rate, and tiny body size, which leads to a lesser need for housing space and feed, quail production has recently demonstrated rising relevance. One of the most crucial nutrients for quail is a high-quality protein supply with a proper amino acid balance (Gheisari et al., 2011).

Quail birds are a readily available source of meat and are resistant to harsh environmental conditions, so different lines of quail are currently raised in the Kurdistan region to supply the local markets with delectable varieties of meat (Baik et al., 1993; Hussen et al., 2019). At 28 days old, the coefficient of variation in body weight ranged from 15 to 24%. To increase yield, body weight (BW) character must also be changed in the environment including nutrition as the primary impacting factor; (Kaur et al., 2008; Baylan et al., 2009). Male and female Japanese quail birds that fed soybean meal protein at 1, 21, and 42 days old had body weights of 8.75, 111.42, and 178.13 gm vs. 9.07, 118.97, and 219.07 gm, respectively (Karaman et al., 2013). Male quail weigh between 110 and 140 grams and female quail range in weight from 120 to 160 grams. Quail eggs have a pale blue, chalky exterior and a brownish hue. An egg typically weighs 10 grams. To achieve rapid development and great egg production, quails must, however, be provided with the best management practices, particularly in the areas of nutrition and feeding. One of the most crucial nutrients for quails is a high-quality protein with an ideal amino acid balance because rapid development needs a high dietary crude protein (CP) intake (Nasaka et al., 2018). Japanese quail (*Coturnix coturnix japonica*) were reared at five different dietary crude protein levels (16, 18, 20, 22, and 24%), and it was shown that the levels of protein had no impact on feed intake or feed conversion ratio. According to their calculations, the Japanese quail rearing period's CP requirement is 23.08% (Soares et al., 2003). From 1 to 21 and 22 to 35 days of age, respectively, Japanese quail fed 26 and 21.6% CP performed well (Hyankova et al., 1997). Before the age of six weeks and for the duration of the production period (after six weeks), the National Research Council (NRC, 1994) recommends dietary CP levels of 24% (ME 2,900 Kcal/kg) and 20% (ME 2,700 Kcal/kg), respectively. The recommended CP levels for quails at the beginning (ME 2,900 Kcal/kg), growth (ME 2,900 Kcal/kg), and laying (ME 2,950 Kcal/kg) phases were 28 percent, 18 percent, and 20 percent, respectively (Leeson and Summer, 2005). In the tropics, quails can be successfully raised on diets with CP levels of 24% (ME 2,750 Kcal/kg), 20% (ME 2,700 Kcal/kg), and 19% (ME 2,650 Kcal/kg), respectively. According to (Kaur et al., 2006), the ideal level of dietary ME is 2700 kcal/kg with a CP of 25.83% for gain and 3100 kcal/kg with a CP of 25.83% for the best feed conversion during the first five weeks of life.

A balanced diet is necessary for quail farming. Quail feed needs a higher proportion of protein than quail chicken feed does. Feed costs may increase as a result, which could reduce the profitability of quail production. Therefore, reducing feed costs is still a big challenge for poultry scientists, integrators, and farmers. This trend is intensifying, which has poultry geneticists and nutritionists considering different approaches to productive chicken rearing.

We see many feeds available in the market for rearing commercial broilers, layer chickens, ducks, turkeys, cattle, Chinese fowl, fish, and other sorts of livestock in Bangladesh. However, no specific feeds are available in the market for raising broiler quail and layer quail commercially. So farmers, researchers, and farm integrators always face difficulties procuring quail feed from the market or feel confused or not determined to select the right feed for raising quail commercially. It is clear that feed is the main component and always costs higher to rear poultry. Farmers are finding it difficult to raise quails because of the unavailability, ignorance of ration formulation, confusion in selecting of right feed, and high cost of commercial feeds, even though they have more dietary needs than other birds. Around 70% of the cost of poultry production is required for feed and it is more exorbitant, though farmers are adopting home mix feed (mash) more frequently.

However, very limited research work, no available data, lack of knowledge on the dietary needs of quail, no specific information on quail ration, confusion of farmers to choose quail feed, etc., appear to be the main constraints or challenges to rear quail commercially. Considering the above, the present study was undertaken to explore the effect of broiler compound feed and manually prepared feeds on the growth performance of broiler quail under commercial farming conditions.

Objectives of the study:

1. To investigate the gross performances (feed intake, feed conversion ratio, body weight, and viability), and profitability of broiler quail fed on ready-made and manually prepared feeds or test diets
2. To assess the meat yield characteristics, gastro-intestinal development and bone quality of broiler quail fed on ready-made and manually prepared diets
3. To identify and suggest the best diet on the basis of nutrient qualities, bird responses, and economically profitable at the farm level

Chapter-II

Review of Literature

Introduction: Ready-made or compound feed is the main source for rearing different species of poultry commercially. Most poultry farmers do not have the ideas or knowledge to formulate poultry diets, particularly quail. So the farmers are badly dependent on the ready-made diet to run their poultry industry. The demand for this diet is increasing day by day to raise commercial chicken only. They just receive the feed as a package form from the market but do not know the procedure of how to make this feed by themselves manually. Available data and reliable information on formulating diets are still obscure to the farmers of quail rearing. Though the increased number of feed mills are in operation in the country to supply poultry feeds, they do not give detailed information about the quality, birds' performances or responses, and nutritive values of their manufactured feed to the farmers. The compound feeds are available in the market in various forms or categories which include, crumble, pellet, and mash feeds. Besides, broiler starter, grower, finishers, layers, or breeder feeds, etc., are made to meet the nutrient requirements of birds according to their age, purpose, and stage of production. To find out the information about responses of feeding different forms of compound feeds such as pellet, mash, and crumble, many research institutes, and libraries were contacted, and internet websites and computer databases were searched during the experiment. The information so far collected regarding this study through deliberate study is reviewed here in this chapter.

2.1 Poultry feed

Food for farm fowl, such as chickens, ducks, geese, and other domestic birds, is known as poultry feed. Prior to the 20th century, chickens were primarily housed on general farms where they foraged for much of their food, eating insects, grain that cows and horses had accidentally spilled, and plants growing nearby. Grain, kitchen trash, calcium supplements like oyster shells, and garden refuse were frequently added to this. Many farms retained flocks that were too big to feed in this way as farming became more specialized, therefore nutritionally complete chicken feed was produced. Grain, protein supplements like soybean oil meal, mineral supplements, and vitamin supplements make up the majority of modern poultry meals. The amount of feed needed and its nutritional requirements depend on the weight and age of the chickens, their pace of growth, their rate of egg production, the weather (cold or wet weather promotes higher energy consumption), and the amount of nutrients they forage for. As a result, there are numerous different feed compositions.

Types of feeds

1. Broiler's starter feed

2. Finisher Feed

3. Chick feed

4. Growing Chicken feed

5. Laying chicken feed

6. Breeder laying feed

Requirement of poultry feed

Processed poultry feed is vital to give chickens the nutrients they need for growth and maintenance, to lower the dangers to their health, and to minimize their excretions and emissions into the environment.

Energy sources of poultry feed

These are described under the following categories:

- Grains and seeds
- Milling by-products
- Molasses
- Roots and tubers

Grains and seeds

Grains are seeds from cereal plants; members of the grass family called Gramineae. Cereal grains are essentially carbohydrates, the main component of the dry matter being starch, which is concentrated on the endosperm. All cereal crops are annuals (Kharif). By-products of harvested grains such as chaff, Stover, and straw are utilized as low-quality forages for ruminant Poultry. Moreover, many of the grains are milled or processed in some manner thereby creating additional by-products that can be fed to livestock with varying degrees of nutritive value. In India except for poultry, swine, and lactating dairy animals, grains are not usually fed for livestock production, because of high cost due to high demand by human beings.

Nutrient composition of grains

The name cereal is given to those members of the Gramineae which are cultivated for their seeds. The dry matter content of grain depends on the method of harvesting and storage conditions but is generally within the range of 80-90%. Protein constitutes 85- 90% of the nitrogenous compounds. The protein occurs in all tissues of cereal grains, but higher concentrations are found in the embryo and aleuronic layer than in the starchy endosperm pericarp and testa. The protein content of grain though variable normally ranges from 8-12%. The lipid content of cereal grains also varies with species, and normally ranges from 1-6%. Maize and oat contain 4-6% oil, while sorghum 3-4%, and wheat, barley, and rice 4 contain 1-3% oil. The embryo or germ contains more oil than the endosperm. Cereal oils are unsaturated, the main acids being linoleic and oleic and because of this, they tend to become rancid quickly. Cereal starch consists of about 25% amylase and 75% amylopectin, although waxy starches contain greater proportions of amylopectin.

Table 1: The major grains used as poultry feed with their chemical composition

Name of grains	Composition
Maize (*Zea mays*)	70% starch, 85-90% TDN, 4% oil and 8-12% protein.
Sorghum (*Sorghum bicolor*)	65% starch, 80-85% TDN2-3% oil, and 8-12% protein
Wheat (*Triticum aestivum*)	75-80%TDN, crude protein content 8-14%
Barley (*Hordeum vulgare*)	Crude protein 11-16% and TDN 78-80%. Lipid content less than 2.5% of dry matter.
Oat (*Avena sativa)*	Crude protein 8-12% and TDN 70-73%.
Rice (*Oryza sativa*):	8-10% crude protein, 9% crude fiber, 1.9% ether extract, 6.5% ash, and TDN 78- 82%.
Rye (*Secale cereal)*	Protein content 10-14% and TDN 75- 80%.

Milling by-products

Table 2: The major milling by-product used in poultry feed with their chemical composition

Milling by-products	Composition
Wheat bran	Crude protein 13-16% and TDN from 65-70%
Wheat middling	96% of the energy value of barley and 91% of the energy value of corn
Rice bran de-oiled	Crude protein 13-16% and TDN 55-65%.
Rice polish /raw rice bran	Oil 13-19%, crude protein 13-16% and TDN 70-90%
Chunies	CP 15-20% and TDN 55-65%.

Molasses

Table 3: Different molasses used in poultry feed with their chemical properties

Molasses	By product of -	Composition
Cane molasses	Sugarcane	At least 43% sugars and have a density of not less than 79.5o brix
Beet molasses	Sugar beet	About 48-53% sugars and have a density of no less than 79.5o brix.
Citrus molasses	Juice of citrus wastes	About 41-43% sugars and have a density not less than 71.0o brix.

Advantages of pelleted feeds

- Compound Poultry feeds are composed of a variety of ingredients.
- Pelleting helps in disallowing the ingredients to segregate.
- It does not allow sorting out certain ingredients and rejecting others.
- It reduces the wastage of feeds.
- Pellets are less subject to infestations by insects and molds.
- Pelleting preserves vitamin A potency and ensures fewer storage losses and prevents the disintegration of nutrients after the feed is mixed.
- It reduces the possibility of adulteration of feeds with undesirable substances.
- It is easy to handle.
- Pelleting kills bacteria like Salmonella and E. coli if any happen to be present in the feed due to exposure to high temperatures.
- Increases palatability and digestibility. Reduces to a certain extent, the microbial degradation of the protein.

Forms of feed

Mash: Mash refers to nutritionally complete poultry feed in a ground form. This is the earliest complete poultry ration.

Pellets: Pellets consist of a mash that has been pelletized; that is, compressed and molded into pellets in a pellet mill. Unlike mash, where the ingredients can separate in shipment and the poultry can pick and choose among the ingredients, the ingredients in a single pellet stay together, and the poultry eats the pellets whole. Pellets are often too large for newly hatched poultry.

Crumbles: Crumbles are pellets that have been sent through rollers to break them into granules. This is often used for chick feed.

Scratch: Scratch grain (or scratch feed) consists of one or more varieties of whole, cracked, or rolled grains. Unlike other feeds, which are fed in troughs, hoppers, or tube feeders, scratch grains are often scattered on the ground. Hence, a large particle size is desired. Because they consist only of grains, scratch grains are not a complete ration and are used to supplement the balanced ration.

2.2: Impact of broiler compound feed and manually prepared mixed diets on the feed intake of quail broiler

The feed intake of poultry is an important criterion for determining the performance of poultry. The feed intake of birds varies with multiple factors which include feed forms (mash, pellet, crumble), feed particle size, palatability, feed composition, fiber content, nutritive values, type of protein uses, dietary protein content/level, amino acid content, sex of the bird, sources of feed, age of birds, type of birds, way of feed formulation (manual or industrial), climate, temperature, heat stress, feed choice, nutrient requirement, unidentified growth factors and so on. We know manual mixed feed (mash) for quail is not available in bulk amounts in the market in comparison to ready-made industrial chicken feed. The research on manual feed versus ready feed for quail rearing is very limited. However, research on broiler chicken focusing compound feed in varieties forms says crumble, pellet and mash is very common.

Bertechini et al. (1992) studied Hubbard chickens given a diet either as pellet or as mash to supply ME 2800, 3000, and 3200kcal/kg diet. They observed that increasing ME in the diet decreased feed intake. They also showed that pelleted diets gave greater feed intake than mash forms. Moran (1990) reared meat-type poultry that was fed a pellet diet. He concluded that pellet permits birds to decrease energy expenditure for food seeking and eating and feed intake was increased. Nir et al. (1995) found that feed intakes were higher in a pelleted diet than in a mash diet. Choi et al. (1986) provided a starter diet in crumble form and a finishing diet in pellet form. They reported that in both cases birds consumed more feeds compared to those fed the mash. Takemasa and Hijikuro, (1983) reported that pelleting of starting and finishing diets for broilers increased feed intake. Park et al. (1983) studied Hubbard broilers and found that the birds ate more pellets than mash during the 9-week growing period. Rabbani et al. (1998) studied the feed intake of 180 broilers chicken fed a starter diet (0 to 5 weeks) containing 22% to 23% CP, 2850 to 2900 kcal ME/kg in mash or crumble form, and in the finishing period (6 to 7 weeks) where they were fed diet containing 19% to 20% CP and 2900 to 2950 kcal ME/kg in mash or pelleted form. Irrespective of age broilers on mash consumed more feed than a pelleted diet. Fujita, (1974) studied cockerel by providing mash or pellets from 17 days to 7 weeks of age. He reported that total intake did not differ significantly between diets. Sengor and Bayne, (1991) provided a starter diet for the first 14 days of life in mash form, from 14 to 28 days of age as a pellet or as mash form, and from 29 to marketing age as a mash or pelleted diet. They observed that feed intake was significantly greater for the pelleted diet.

A study conducted by (Rahman et al., 2010) reported that the average daily feed consumption of Japanese quails rose with increasing dietary protein levels. The results of (Vercese et al., 2012) showed that the feed intake of quail decreased by 7.8%, when the control temperature was compared to the 27°C cycle temperature, negatively affecting other performance measures such as egg weight, egg mass, and feed conversion ratio per dozen. There was a noticeable decrease in feed intake of 11.97, 16.67, and 21.55%, respectively when feed intake measured at thermal neutral temperature (21°C) was compared to those validated at cyclic temperatures of 30, 33, and 36°C.According to (Kar et al., 2017), the daily feed consumption for control feeding and choice feeding of adult quail was also varied ranges from 24.92gm to 24.38gm, respectively.

Dauda et al. (2014) reported that feed consumption increased as the animals aged, rising from 3.1gm in the first week to 15.2gm in the sixth week. The results of (Paca et al., 2020) indicate at the fifth week of age, the total feed intake showed that the home-mix diet consumed substantially more feed (170.0gm) than the commercial ration (112gm) per quail/week.

Dietary energy levels did not alter average feed intake, body weight, or FCR except for days 29–49, according to the findings reported by (Gheisari et al., 2011). The average feed intake increased from 24 to 25.7 g/day when the ME content of the finisher diet (29-49 d of age) was reduced from 2900 to 2700 kcal/kg. In the finisher phase, when a chick's energy needs are somewhat higher than during the starter and grower phases, it appears that a higher feed consumption with a decreased dietary energy concentration was mostly caused to compensate for energy intake.

2.3: Effect of broiler compound feed and manually prepared complete diet on the growth performance of quail broiler

Broilers fed on the compound or manually prepared diets of different forms show variation in their growth performance by far. Different researchers reported both positive and negative results regarding the application of compound feeds to poultry. Much is known about broiler chicken but the research focusing on quail broiler fed ready or home-made feed is very scarce.

However, research conducted by Nasar et al. (2016) reported that Japanese quail fed on a low-protein, and low-energy diet found higher body weight gain rates and economic effectiveness. The results of (Paca et al., 2020) indicated that the body weight gain of quail measured at the third, fourth, and fifth weeks of age in commercial ration and home-mix ration were 27.20±3.12, 22.05±0.74, 12.30±2.54 g, and 21.95±2.36, 19.44±1.2, 10.96±2.09g, respectively.

Many previous researchers reported that growth responses of the broiler chickens were found to be influenced by ready-made broiler feeds from different feed mills when allowed to the birds (Roy et al., 2004, Hossain et al., 2006, Ghosh et al., 2019). Feed collected from different feed mills might vary in quality, composition, physical or external characters, palatability, flavor, odor, texture, color, presence of foreign particles (dust, stone), and moldy, nutritive value and so on. These characteristics of poultry feed might affect the feed preference or performance of broilers adversely (Rose and Kyriazakis, 1991; Forbes and Shariatmadari, 1994).

Ashour et al. (2015) found that quail at the age of 5 weeks, live body weight, and weight gain were significantly affected by treatments throughout the experiment, with birds fed broken rice at a 20% level during all experimental periods achieving the highest values of Live Body Weight and Body Weight Gain in comparison to the other groups, at 189.53 grams and 5.70 grams, respectively.

Bertechini et al. (1992) showed that Hubbard broiler chickens grew faster on pelleted diets than on mash feds. Choi et al. (1986) reported that chicks fed the crumble starter diet gained more weight and increased feed intake than those fed the mash diet. Asha Rajiniet al. (1998) reported that birds fed on pellets (ME, 2700kcal/kg; CP 23%) gained heavier body weight up to 4 weeks of age in summer.

Significant improvement in body weight was observed by (Karavashenko et al., 1986) when broilers fed on compound (pelleted) feeds with or without components of animal origin in cages. Kim et al. (1994) reported better growth when broilers were fed compound feed (crumble-pellet).

Kim and Chung, (1996) used starter (0 to 21 days) and finisher (22 to 42 days) diets as all mash, mash-pellet, mash-crumble, crumble-pellet crumble-mash diets for Arbor Acres broilers. At 42 days of age overall body weight gain of chicken-fed crumble-pellet was greatest than for all mash and extrusion. Kamar et al. (1974) studied the performance of broilers with different forms of feed. They found that pellet-fed birds tended to have accelerated growth rates at later ages over mash-fed ones. Proudfoot et al. (1982) used three forms of diet, mash, crumble-pellet, and ground crumble-pellet to 7200 broilers. Birds fed on the crumble-pellet diet grew more rapidly than those on either the ground-pellet or all mash.

Sinha et al. (1994) reared Shaver broiler chicken up to 5 weeks of age and fed on broiler pellet (2900kcal ME/kg; 23% CP) or grower mash diet (2600kcal ME/kg; 16% CP). They reported that chickens fed on a pelleted diet had higher live weight than those broilers fed on a mash diet. Ojedapo et al. (2014) found that female birds had a live weight that was greater than that of male birds (129.43g vs. 128.50g). At 14, 28, and 49 days old, the average live body weight of quail chicks fed on 2700 kcal ME/kg was 38.6, 115, and 208.4 grams, and that on 2900 kcal ME/kg was 39.3, 117.3, and 210.1 grams, according to the findings of (Gheisari et al., 2011).

2.4: Response of readymade feed and manually prepared feed on FCR of quail broiler

Many previous researchers reported that feed conversion of the broilers were found to be influenced by ready-made broiler feeds of different feed mills when allowed to the birds (Roy *et al*., 2004, Hossain *et al.,* 2006, Ghosh *et al.,* 2019). This might be happened due to different nutrient concentrations contained in the different sorts of compound feeds.

Asha Rajini et al. (1998) reported that pellets had better feed efficiency than broilers up to 6 weeks of age. Mitchell et al. (1972) reported that pelleting diets significantly improved feed conversion during 7 to 24 days of age as compared to mash. Bertechini et al. (1992) provided a diet either as mash or as pellets with 2800, 3000, and 3200 kcal ME/kg diet to Hubbered chickens. They observed that an increase of ME in the diet linearly improved feed conversion efficiency. Plavnik and Hurwiz, (1989) suggested that pelleted diets improved growth and thereby affecting feed efficiency. Scott et al. (1998) reported that hens fed mash and pellets had 4% better feed efficiency. Savory, (1974) concluded that pelleted feed was more efficiently utilized than mash because chicks spent less time on feeding pellets and so expended less energy. As a result, there may have been improved digestibility when the feed was pelleted. Proudfoot and Sefton, (1978) used 800 chicks in two trials, where crumbles starting diet were fed from 1 to 28 days, pelleted finishing diets from 29 to 49 days, or the same diets as mash. They reported that feed conversion efficiency was better on crumbled and pelleted diets than on mash. Milsevie et al. (1986) studied with Hybro, Ross, Hubbard, Prelux Bro, and Vedette broilers and they were given starter and finisher diets containing 22% and 20% protein as pellet or mash. They reported that broilers on pellets had higher feed conversion efficiency than on a mash diet. Mendes et al. (1995) in a study with Arbor Acres broilers fed maize and Soybean oil meal-based diet as pellet or mash. They found better feed conversion for chicken given a pelleted diet. (Kim et al., 1994) conducted a study with Arbor Acres broilers by feeding mash, extrusion; crumble starter diets with finisher pellet. They found significant improvement in feed conversion in a crumble-pelleted diet. Oguntona and Hughes, (1988) reported that feed conversion efficiency was the poorest in the mash with low energy and highest in pellets with higher energy. Kim et al. (1994) fed starter (0- 12 days) and finisher (22- 42 days) diets as all mash, mash-pellet, mash all crumble, crumble- pellet and crumble mash to Arbor Acres broilers. Feed conversion was significantly better for chickens with mash pellets from 21 to 42 days.

Howlider and Rose, (1992) found that pelleting increased feed conversion by 5.9% than mash. Kamar et al. (1974) observed that pellet feeding improved feed conversion than mash feeding. Rabbani et al. (1998) studied broilers chicken fed a starter diet (0 to 5 weeks) containing 22 to 23% CP, 2850 to 2900 kcal ME/Kg in the mash or crumble while in the finisher period (6 to 7 weeks) were fed a diet containing 19 to 20 % CP and 2900 to 2950 kcal ME/kg in the mash or pelleted form. They reported that the form of diets had no effects on feed efficiency irrespective of age. Reddy and Narahari, (1993) fed diets to broilers containing 23.20 and 23.04% CP and 2283.93 and 2433.02 kcal ME/kg as mash or pellet form for 0 to 8 weeks of age. They obtained better feed efficiency on pelleted diets compared to mash.

Paca et al. (2020) showed that the FCR values for commercial ration and home-mixed ration at the third, fourth, and fifth weeks of age of quail birds were 3.13±0.06, 3.96±0.59, 7.98±2.40, and 3.03±0.29, 3.95±0.61, 8.38±2.07, respectively. At d0-14, 15-28, and 29-49 days of age on 2900 ME kcal/kg and 2700 ME kcal/kg FCR values were 2.58, 2.76, 5.21, and 2.54, 2.82, and 5.55, respectively, according to the findings of (Gheisari et al., 2011).

The older Japanese quails' capacity to store more energy as fat in body tissue, which was aided in particular by a meal containing 2900 kcal ME/kg and a relatively low quantity of protein, may be the cause of the improved FCR during the last stage of rearing (29-49 d). The best FCR has, however, been found in the birds fed low protein diets at both energy levels (2700 and 2900 kcal ME/kg).

2.5 Response of readymade feed and manually prepared feed on meat yield of broiler quail

Choi et al. (1986) provided a starter diet as mash or as crumble form and a finisher ration as mash or as pellets. They observed that in the starter period crumble diet significantly decreased gizzard weight and in the finisher period pelleting diet also significantly reduced the weight of the digestive tract and gizzard more than those fed on the mash diet. Mendes et al. (1995) studied 1000 Arbor Acres male and female broilers fed on a pellet or mash diet and stated that meat yield was greater for chicken given mash than a pelleted diet. Nir et al. (1995) reported that pelleting reduced the relative weight of the gizzard while increasing the relative weight of abdominal fat.

Kim et al. (1994) experimented with Arbor Acres broiler with different forms of feed, mash, extrusion, crumble-starter, and finisher diets and crumble starter with a pelleted finisher. They found that gizzard weight was highest in broilers fed mash. Howlider and Rose, (1992) observed that the total meat yield as a proportion of body weight, was not altered by sex or diet form. The pellet fed increased the fatness compared with the broilers given with the mash feed. Kubena et al. (1974) observed that female broilers generally had a higher percentage of abdominal fat than males as a percentage of body weight at the 7^{th}, $8^{th,}$ or 9^{th} weeks of age. Howlider and Rose, (1992) reported that the percentage of breast, thigh, and drumstick in the carcasses of chickens fed on grower mash diets were 9.7, 10.3 and 6.8% respectively, which were lower than that of chickens fed on pellet diets(13.4, 8.2 and 12.2% respectively). Sinha et al. (1994) reported that the percentage of breast, thigh, and drumstick muscle in the carcasses of chicken fed on a grower mash diet were 9.7, 10.3, and 6.8 respectively which were lower than those of chicken fed on a pelleted diet (13.4, 8.2 and 12.29% respectively). Kim et al. (1994) reported that the crumble pellet diet showed a higher carcass yield of broilers. Pesti et al. (1983) reported that crumbling with a low-density diet increased the percentage of abdominal fat by 23 and with a high-density diet, it decreased by 1%.

Research done by (Genchev et al., 2008) shows that the age, strain, line, and sex of the quails at slaughter all affect the carcass output of Japanese quail. The results of (Dauda et al., 2014) indicated that the feed conversion ratio in quail increased gradually at the beginning of life and then increased significantly as birds reached maturity.

Quail carcass yield percentage was between 67 and 70 percent according to (Caron et al., 1990). According to research by (Ashour et al., 2015), broken rice was given to quail chicks at levels of 30 and 50%, and these amounts resulted in the maximum dressing and carcass yield values. In contrast, quails fed broken rice at a level of 20% replacement with maize food had the lowest values measured.

According to (Nasr et al., 2017), when compared to the other plumage colors, the white quail had the highest weight of slaughter and carcass, dressing percentage, carcass yield, and the weight of the liver, gizzard, heart, and spleen (197.27 grams, 169 grams, 91%, 82%, 6.63 gram, 6.53 grams, and 0.40 grams, respectively).

The results of (Kaye et al., 2014) stated that the superior efficiency and capacity for meat production of Japanese quails are indicated by the higher carcass yield of these birds. White quail had the heaviest carcass weight despite being slaughtered, but it was still within the range of 140-169 grams and 163-195 grams that had been reported. Brown, black, and golden quail weighed between 2.19 and 5.95 and 2.2 and 4.7 grams for the liver and gizzard, respectively.

According to research by (Tserveni et al., 1986), males had a higher average carcass yield than females (76.9 vs. 72.7%). It is possible that the lighter liver and digestive system weights in males, who typically weigh less than females, are responsible for their higher production. The average weight of the gizzard, liver, and heart per quail in groups A and B, respectively, was found to be 3.0, 1.3, and 3.3, according to (Rajput et al.,2016) research.

The carcass yield of quails varied between 66 and 73%, according to (Yalcin et al., 1995). According to research by (Caron et al., 1990), females generated carcasses that were heavier than those of males (161.7 versus 150.9 g, P.05). However, the male carcass yield was 5.8% higher than the female carcass yield, coming in at 71.7%. Body weights after slaughter for female birds were greater than for their corresponding male birds, according to the findings of (Ojedapo et al., 2014) (133.93g vs 122.13g).

Although female birds' thighs and shanks weighed more than those of male birds, respectively (11.40g vs. 10.55g and 2.68g vs. 2.60g), the difference was only marginal. The female birds' hearts weighed 1.33g as opposed to 1.00g for the male birds. Gizzard weight varied more between the sexes (4.68g vs. 3.53g), favoring the females. The liver weight readings were similarly greater in female birds (5.15g vs. 3.48g) than in male birds. In comparison to the male birds, the female birds' offal weight was higher (12.18g). The average values for breast weight, leg weight, and wing weight features recorded at 4 weeks in the C line were the lowest among other weekly averages of both the C and S lines, according to the findings of (Narinc et al., 2014). Also discovered in the C line were negligible variations in wing weight between 4 and 5 weeks of age. The highest mean values for breast weight (53.02 to 55.67 g) were discovered in the S line at the age of 6 to 8 weeks, whereas the highest mean values for leg weight (32.63 to 34.81 g) and wing weight (13.31 to 13.94 g) were discovered in S line at the age of 5 to 8 weeks.

Japanese quails with black spots (101.41 g) had a considerably greater carcass weight than those with brown spots (96.42 g) and white spots (92.87 g), according to research by (Kumar et al., 2011). Compared to male birds, which recorded carcasses weighing 93.68g, female birds' carcasses weighed 100.12g. Japanese quails from the brown, white, and black spotted strains had dressing percentages of 62.81, 62.59, and 62.18 g, respectively. Japanese quails from the black spotted strain had a percent breast yield of 38.65, which was significantly greater than those from the white (37.90) and brown (38.43) strains. The respective percentages of wing yield for the brown, black, and white strains of Japanese quails were 10.83, 10.80, and 10.73. White, brown, and black spotted strains of Japanese quails had neck yield percentages of 5.87, 5.79, and 5.66, respectively. Compared to the white (24.53) strain, the percentage leg yield of brown (25.35) and black spotted (25.32) strains of Japanese quails was much greater.

2.6: Response of readymade feed and manually prepared feed on viability or mortality of quail

Many previous investigators reported that compound feed had no significant impact on the viability or mortality of broiler chicken, when the birds were allowed to consume different types of commercial broiler feed (Hossain et al., 2006; Hossain, 2003, Ghosh et al., 2019). Besides, Kamar et al. (1974) reported that less mortality was found in case of broiler-fed compound (pellet) feed than in other types of feeds at all ages. Burbosa and Compos (1992) showed in their report that mortality was higher in pellet feeds and males were more susceptible than females.

The maximum mortality of Coturnix is experienced in the first week in the battery cages, according to the findings of (Vohra et al., 1971), and this is not because of any dietary treatment. It is caused by a management issue, such as drowning in indoor water fountains, and has been somewhat mitigated by adding screens to the water to lessen the depth. Between the hatch and 1 week of age, a mortality rate of 18.34% was recorded. While 1.49% was obtained for weeks 4-5, the value of 2.90% for weeks 1-2 falls within 2.20 and 10.00% as the mortality rate of quails housed in pens and cages, respectively. According to research by (Roshdy et al., 2010), the housing system has an impact on the average mortality rate of male and female Japanese quails. The mortality rate was adversely affected by battery cages. Regardless of gender, birds kept in pens had a lower mortality rate than those kept in cages (10.00 vs. 2.22%, respectively). Contrarily, regardless of the housing system, males had a higher mortality rate than females (16.67 vs. 0.83%, respectively). According to the report of (Dauda et al., 2014), the mortality rates were 18.34%, 2.90%, and 1.49% between 0-1, 1-2, and 4-5 weeks, respectively.

According to the results of (Gebhardt-Henrich et al., 1995), mortality from hatching to 44 days was lower in the C line (Experiment 1) than in the P line (Experiment 2) and twice as high in restricted quail as in ad libitum quail (C line: restricted, 5%; ad libitum, 2.5%; and P line: restricted, 30%; ad libitum, 18%).

2.7 Response of ready-made feed and manually prepared feed on bone quality broiler quail

Nutritional balance especially in calcium, phosphorus, and vitamin D is very important for bone growth and proper bone health (Fleming, 2008). Along with them vitamin K, enzyme supplements, and lipid contents were found to improve poultry bone morphology in different studies. Vitamin K is necessary in the skeleton for the post-translational modification of osteocalcin, a protein related to bone formation (Hauschka et al., 1989). (Chang'a et al., 2019; Mulvenna et al., 2022) reported the addition of enzymes in poultry feed can improve bone morphology significantly. Dietary lipids play an important role in the development, growth, and modeling of long bones. Numerous animal studies have shown a positive effect in quails fed on n-3 PUFA on bone morphology, mineral density, bone mineral content, and bone strength (Liu et al., 2003; Ebeid et al., 2011). Cruvinel et al. (2021) reported the importance of dietary electrolyte balance in quail feed for bone health. Cadmium, boron, and boric acid supplement can also significantly improve bone characteristics in quail (Olgun and Yildiz, 2014; Simsek et al., 2020).

2.8: Response of ready-made feed and manually prepared feed on profitability or economic cost-effectiveness of broiler quail

Farm animal populations are undergoing continuous selection to improve the economic efficiency of animal production (Svitakova et al., 2014). Animal production itself is affected by a number of both external and internal factors that unequivocally include feed or nutrition. Apart from nutrition, the farm profitability could be influenced by many other factors say feed price, feed form, feed composition, labor cost, housing, marketing of live birds or dressed carcass, price of feed kinds of stuff, price of day-old chicks, vaccination, medication and so on. The findings of the earlier researchers (Siddique et al., 1996; Redoy et al., 2017) reported comparable financial outcomes when quail were raised with ready-made feed.

A research conducted by (Nasar et al., 2016) reported that Japanese quail fed on a low-protein, and low-energy diet found higher body weight gain rates and economic effectiveness.

The findings of previous investigators (Hossain, 2003, Ghosh et al., 2019) reported that broilers fed compound ready feed got higher profit when the production cost was lowest for rearing broiler chicken. Rabbani et al. (1998) studied the feed cost of 180 broilers chicken fed ad-libitum on a starter diet (0-5 weeks) containing 22 to 23% CP, 2850 to 2900 kcal ME/kg in mash or crumble form while in the finishing period (6-7 weeks) they were fed diet containing 19 to 20% CP and 2900 to 2950 kcal ME /kg in mash or pelleted form. They reported that irrespective of age, feed cost was lower for producing broilers at different ages when fed in pellets compared with mash. Gracia et al. (1975) stated that a compound (pelleted) diet decreased the production cost of meat. Kim et al. (1994) observed that production cost was almost similar between crumble pellet diets.

2.9 Importance of the current study

Very few research works have been done so far regarding ready-made broiler feeds or homemade mixed feeds on broiler quails. The results and information on the nutritive value and quality of the compound feeds or homemade feed might act as guidelines for poultry farmers and poultry researchers to formulate efficient diets, which could help poultry integrators to boost broiler quail meat production more efficiently. In addition, the study could help poultry farmers to make them self-reliant and thereby improve their socioeconomic condition. Further, broiler farming might be an important tool with which farmers can do poverty alleviation, reduction of malnutrition, and female empowerment. After all, the national economy and GDP of the country might be enhanced by this sort of research work on poultry farming.

Conclusion:

From the above discussion, it could be assumed that the application of compound feed or homemade feed on the broiler quail, might enhance quail meat production more efficiently. In this regard, farmers might be more enthusiastic to extend the poultry farming business, as a compound feed of good quality is available in the market as much as they need. Further, it might encourage the farmers to prepare ready-made diets or home-made diets to run poultry business. Data on the compound or homemade quail diet is not adequate, and it might warrant further study to boost quail broiler production tremendously.

Chapter-III

Materials and Methods

3.1: Statement of the experiment

The experiment was carried out at the Department of Dairy and Poultry Science, Chattogram Veterinary and Animal Sciences University (CVASU) to ascertain the productivity of broiler quail fed ready-made broiler feed and manually prepared feed. Feeding trial in quail was performed at the Research and Farm-Based Campus of CVASU (Hathazari), Chattogram from August to September 2022. Laboratory analyses were performed in the Department of Animal Science and Nutrition Laboratory, Department of Dairy and Poultry Science Laboratory, Poultry Research and Training Centre (PRTC), and Biochemistry Laboratory of CVASU, Khulshi, Chattogram.

3.2: Preparation of the experimental shed

Firstly, the experimental poultry shed was prepared by swiping and removing dust and dirt with a broom. The cage was also washed and cleaned with a whisk. Both sheds and cages were then washed and cleaned properly with tap water containing detergent. The shed and cages were left for air drying for 3 days. After that, the ceiling, wall, and floor along with battery cages were treated with disinfectant with FAM 30 (5ml/1L water) via sprayer and again left for drying for 1 week. The cage is divided into 15 pens of equal size to accommodate quails. Before allowing the entrance of quails, the individual tube feeder, drinker, and each pen were marked properly by the sticker (bearing cage no. and treatment). An electric bulb (60watts) was used to light the room and set 2 bulbs on the roof of the room by hanging condition. The floor space provided for each bird was 0.6 sq. ft in the cage. The floor of each pan was covered with medium-thick paper to reduce leg injury and to maintain the warm temperature within each pen. All equipment was cleaned and disinfected accordingly outside the shed.

3.3: Collection of quail and experimental design:

A total of 150 Japanese quail chicks (aged 11 days) of either sex were purchased from a local commercial hatchery and reared at the Poultry Research Shed of Research and Farm-Based Campus of CVASU (Hathazari), Chattogram. Quails were weighed first, and then randomly distributed into 3 treatments, each treatment was replicated 5 with 10 chicks per replicate cage in a completely randomized design (CRD). The layout of the experimental trial is demonstrated below in Table 4:

Table 4: Experimental design

Treatments	Number of replicates					No. of chicks per treatment
	R_1	R_2	R_3	R_4	R_5	
T_1	10	10	10	10	10	50
T_2	10	10	10	10	10	50
T_3	10	10	10	10	10	50
Total	30	30	30	30	30	Grand Total=150

[T_1 refers to control or basal diet while T_2, T_3 refer to broiler feeds which were procured from the local market of two feed companies *i.e* Aman and Nourish feed, respectively; R_1, R_2, R_3, R_4, and R_5 refer to replicates 1, 2 and 3, 4, 5 respectively]

3.4: Collection of the experimental feed and feedstuffs

Broiler pre-starter (crumble) diet Nourish and Aman were collected from the local market and used to feed the birds for up to 6 weeks. The macro-feed ingredients (maize, soybean meal, fish meal, palm oil, and limestone) required for the basal diet were procured by purchasing from the local market of Pahartali and Rajakhali Bazar, Chattogram. Each macro-ingredient was purchased based on thorough selection by visual observation like organoleptic test (color, odor, moisture, etc.). The micro-nutrients were procured from another local market (Hazari Lane, Terry Bazar, Chattogram). Samples were taken from the procured and handmade diets before supplying the quails in a trial pen and sent to the lab for proximate analyses. The proximate composition and reporting values of the chemical composition of readymade feed were shown in Table 5:

Table 5: Nutrient composition of readymade feed

Nutrients (%)	**Nourish Feed**		**Aman Feed**	
	Proximate values	Reporting values	Proximate values	Reporting values
ME	-	2950	-	3000
Moisture	12.69	12.00	11.83	11.00
DM	87.31	88.00	87.18	89.00
CP	21.98	21.00	22.51	22.50
CF	4.00	5.00	4.32	3.00
EE	2.39	5.00	2.62	5.00
Ca	1.00	1.00	1.00	1.00
P	0.58	0.45	0.54	0.50
Ash	5.23	5.00	5.28	5.00

3.5: Dietary treatment

A basal/control diet (T_1) was formulated with the locally available feed ingredients to meet or exceed the requirements of NRC (1994), as shown below in Table 3. Diet T_1 was considered home-made or manually feed prepared with the local cheaper feedstuffs, while T_2 was ready-made broiler feed procured from the local market of Aman Feed Company, and T_3 is also ready broiler feed collected from the market of Nourish Feed Company. These three diets including T_1 (manually prepared feed /control), T_2 (ready-made feed -Aman), and T_3 diet (Ready feed-Nourish) were used as a treatment to run this experiment up to 42 days age of birds. Ready-made broiler feeds (crumble) procured from the local market and formulated diets (mash) were allowed to feed the birds for up to 42 days. All the birds had free access to the diets and ad libitum fresh, clean drinking water was made available for entire the trial period. The composition and nutritive values (calculated and analyzed in the lab) of the formulated or basal diets were shown below in Table 6.

Table 6: Ingredients and nutrient composition of basal diet.

Ingredients	Inclusion level (%)
Maize	53.00
Vegetable oil	2.20
Soybean meal	35.92
Fishmeal	5.90
Limestone	1.0
Di-calcium phosphate	0.30
Common salt	0.39
Lysine	0.20
Meth	0.30
Choline chloride	0.04
Toxin binder	0.25
Vitamin	0.50
Nutrients(%)-calculated value	
ME	2918.70
CP	24.462
CF	3.66
EE	5.15
Ca	1.04
P	0.74
Nutrients(%)-Proximate value	
DM	86.85
Moisture	13.15
CP	24.38
CF	3.66
EE	3.51
Ash	5.52

3.6: Feed grinding, mixing, and preparing the diet

First of all, the macro ingredients collected from the local market in ground form have a desirable particle size, weighed, and mixed. Then micro-ingredients were also weighed by electric balance one by one and then put in a small bucket for each diet and mixed properly by turning layer by layer. After that, the weighed macro-ingredients were spread on the wide plastic paper kept on the floor of the house and mixed thoroughly with the help of a shovel. After that, the micro-nutrients were mixed in the feed mixture equally. Vegetable oil (Palm) was added at half of the required amount by sprinkling over the feed mixture and then mixed thoroughly with a hand as well as a shovel. The remaining half amount of vegetable oil was finally sprinkled over the feed mixture and again mixed thoroughly by both hand and shovel. A thorough mixing was done manually with a shovel after weighing all ingredients as per the requirement of the individual diet. Finally, the mixed diets were stored in the bags with markings and later used for feeding the birds as mash feed. The same procedures were followed for the preparation of all diets.

3.7: Management

Throughout the entire experimental period, the following management practices were used to maintain uniformity (similar feeding, lighting, and environmental condition) in the management practices as much as possible.

3.7.1: Brooding

The collected 150 quail chicks at the age of 11 days were randomly distributed in 15 equal-sized pens, which were previously cleaned and disinfected. Quail chicks were brooded with special care and management because they are very smaller in size and weigh about 30-32 grams unlike the chicken, the chicks were brooded with an electrical bulb (60 watts), which was placed at each replicate pen hanging condition. The temperature was gradually reduced by 1 or 2 °C every 1 or 2 days until the chicks were 19 days old at which point the temperature was maintained at 24 °C for the rest of the trial. Each pen was furnished with a feeder and drinker.

3.7.2: Stocking density

Birds were reared in battery cages of 15 equal size pens. Ten (10) quail chicks allowed for each pen of equal size (2×1 sq. ft.) in a battery cage were marked out for 150 birds. The space given per chick was 0.2 square feet in a battery cage to facilitate their proper feeding watering and management.

3.7.3: Feeder and drinker space

One drinker and one feeder were kept in each pen. One square-shaped flat feeder and one small-sized bottle drinker with a capacity of 250ml were provided for each pen. The flat feeder and drinker were kept beside to make it easy for the birds to intake food and water. Drinkers are cleaned and dried with detergent water at 2-3 days intervals. Birds were allowed to mash their diet from a flat feeder from d 1-31 days.

3.7.4: Feeding and watering

Feed and drinking water were supplied ad-libitum to the birds throughout the experimental period. Feed was supplied to birds from day 50 to day 72 two times daily, where once at 6 AM and another at 6 PM. Fresh, clean, and cool drinking water was supplied to the birds three times a day i.e., at 6 AM, 12 AM, and 6 PM.

3.7.5: Lighting

A continuous lighting program was followed for lighting, 23 hours of lighting, and 1 hour of darkness.

3.7.6: Immunization of birds

No vaccination is given to the Quails as they are very resistant to diseases.

3.7.7: Medication

The quails were given glucose and vitamin C in order to minimize any stress that might have occurred due to extra humid and warm weather. During the course of the experimental period, electrolytes and vitamin C were added to the drinking water to combat stress due to high environmental temperature (33 to 37 degrees C). Salt and mineral drugs were provided with drinking water to prevent cannibalism.

3.7.8: Sanitation

Adequate and proper hygiene and sanitary measures were adopted and followed throughout the experimental period. Proper cleaning and disinfection of all equipment were done before the beginning of the trial. Potassium permanganate ($KMnO_4$) solution (1.5 %) was prepared and kept in a plastic bottle fitted with a sprayer at its opening mouth. It was kept at the entry point of the poultry shed and used as a disinfectant before entry into the poultry shed. Hands and feet were also properly disinfected with 70% alcohol before entry into the shed.

3.8: Data and sample collection

Feed and test diet samples were collected before supplying birds for the assessment of the nutritive values (DM, CP, CF, EE, Ca, and P) of each diet. Body weight, feed intake, and feed conversion ratio (FCR) were measured weekly basis. Mortality was recorded as and when it occurred. Livability was calculated from the mortality of birds per replicate cage. On day 42 day's age, two birds were selected randomly per treatment group and slaughtered humanely to assess the dressing yield traits (dressing%, breast weight, thigh weight, drumstick weight, shank weight, neck weight, shank weight, neck weight characteristics) of broiler quails. Relative weights of gastrointestinal organs (liver heart, proventriculus, gizzard, spleen) were also recorded at this stage on day 42. Feed samples were also collected before supplying the birds to assess the nutritive value of the feeds. Cost-benefit was calculated at the last of the trial.

3.9.1: Method of quail processing:

On the last day of the experimental period, two quails were chosen at random, weighed, and humanely killed from each replication pen to evaluate the meat characteristics of the body carcass yield (dressing %, breast weight, thigh, drumstick, back, wing, head, shank, neck), and the weight of the visceral organs (liver, heart, proventriculus with gizzard). Three hours before of slaughtering, feed and water were removed from the enclosures to allow for appropriate bleeding and skinning. Following the killing procedure, the carcasses of the birds were processed by being stripped of their feathers, skin, heads, shanks, viscera, hearts, kidneys, livers, lungs, and small and large intestines. By carefully cutting and fractioning the heart and liver free from the gastrointestinal system, they were removed. The liver's gallbladder was removed. By cutting the gizzard and proventriculus free in front of the duodenum and behind the final portion of the oesophagus, the gastrointestinal tract was separated.

3.9.2: Record keeping:

The following parameters were observed and recorded during the entirety of the trial period.

a) Mortality:

Mortality was measured or recorded as when it occurred.

b) Body weight:

Quails' weekly live weights for each condition were calculated using repetition. The average live weight of the quails was also noted by the weighing scale at the beginning of the trial and the finish of each weekend.

c) Feed intake:

The amount of feed consumed was calculated by subtracting the amount of leftover feed from the total amount of feed provided to birds each weekend.

d) Water intake:

The amount of water consumed was calculated by subtracting the amount of leftover water from the total amount of water provided to birds each weekend.

3.10: Calculation of data:

a) Body weight gain (BWG):

The weight increase was estimated by deducting the initial body weight from the end or final body weight. BWG=Final body weight (g) –Initial body weight (g).

b) Feed conversion ratio (FCR):

FCR refers to the amount of feed needed per unit of production (meat or egg). Feed efficiency is the efficiency of converting feed to meat or egg or other products. The formula used to compute FCR was as follows:

$$\text{FCR} = \frac{\text{Feed intake}}{\text{Body weight gain}}$$

c) Mortality and livability:

The number of deceased birds during the experimental period divided by the total number of housed birds at the beginning of the experiment served as the foundation for the calculation of bird mortality. The mortality of the birds in each replicate cage was used to calculate livability. This formula was used to determine the fatality percentage.

$$\text{Mortality (\%)} = \frac{\text{Number of broilers died}}{\text{Toutal number of broilers housed}} \times 100$$

d) Dressing percentage:

The following is how the dressing % for the birds was calculated:

$$\text{Dressing (\%)} = \frac{\text{Dressed Weight}}{\text{Live Weight}} \times 100$$

3.11: Sample processing and analyses:

3.11.1: Feed sample:

Six feed samples (2 samples for each diet) were collected from ready-made or test diets before feeding the birds. The samples were processed by grinding with the help of mortar and pestle and then mixed thoroughly for lab analyses. About 500gm of each diet was taken and sent to the PRTC lab for proximate analysis. Each analysis was done three times for each sample to minimize technical errors. The samples were tested for proximate analysis of dry matter (DM %), moisture %, crude protein (CP %), crude fiber (CF %), ether extract (EE %), and ash using standard laboratory procedures. Dry matter estimation was done by oven-dry method. Crude protein estimation was accomplished by the Kjeldahl Method. Ether Extract estimation was done by the Soxhlet apparatus. Ash was measured by igniting the pre-asking sample on a Muffle furnace at a temperature of 600°C for four to six hours.

3.11.2: Evaluation of meat yield parameters:

On day 42, two broilers were humanely killed, and various meat yield parameters, such as carcass weight, dressed weight, and abdominal fat content, as well as the weights of different meat cuts (neck, thigh, wings, breast, back, shank, drumstick), and giblets (heart, liver, proventriculus with gizzard), were precisely recorded.

3.11.3: Production cost:

When determining the cost of production, we took into account the money spent on chicks, feed, vaccines, and other related items. The price of the chick was determined by the total cost of the purchase. The cost of the feed was calculated based on the sale price of the feed that was offered by the corporation to the dealers.

3.11.4: Statistical analyses:

All collected data were subjected to analysis by one-way ANOVA procedure using Minitab software (Minitab, Minitab Version, 16, 2000). The significance of differences between means was tested using Duncan‘s multiple range tests (DMRT). Statistical significance was considered at $P \leq 0.05$.

Photo Gallery of some activities during the experiment

Figure 1: Cleaning, Washing, and prepared of shed and cages

Figure 2: Mixing and packaging of feed

Figure 3: Weighing and recording of feed

Figure 4: Collection of birds from Hatchery

Figure 5: Physical Examination of bird

Figure 6: Weighing of birds

Figure 7: Feed supply to the birds

Figure 8: Catching the Bird for experimental purpose

Figure 9: Glance of quail at day 42 of experiment

Figure 10: Slaughtering, Carcass examination, and sample Collection

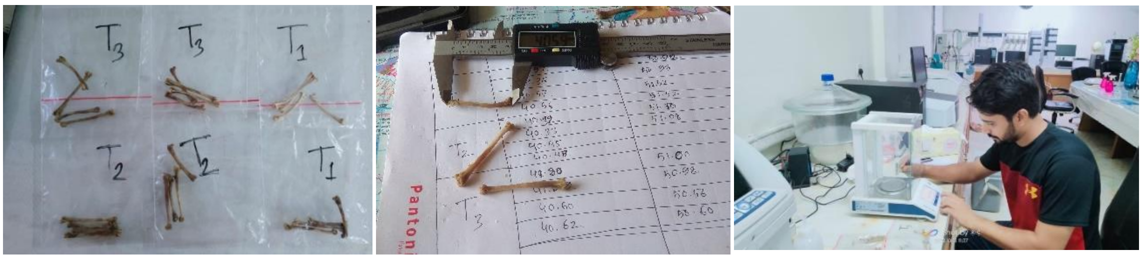

Figure 11: Bone sample, measuring, and weighing of bone

Chapter-IV

Results

The gross responses of broilers in terms of feed intake, live weight, body weight gain, FCR, and viability are stated below in a tubular form. Apart from this, carcass yield traits, gastrointestinal organ weights, bone quality, and profitability of broiler quail data are also represented below in this section.

4.1: The gross response and livability of quail fed on ready-made broiler feed and manually prepared feed from d1-42

4.1.1: Body weight

Table 7 shows the result of body weight (BW) of broiler quails from d11 to 42 days. The BW data revealed that significant ($P<0.05$) differences were observed during all the trial periods between treatments except for 11-39 days only. Quail-fed T_2 diet attained the highest ($P<0.05$) BW compared to other treatments. The BW of quail was also poorly improved ($P<0.06$) in the T_2 dietary group during days compared to others.

Table 7: Body weight (BW) of broiler quail fed on ready-made or manually formulated diet

Trait	Days	Treatment			SEM	P-value
		T_1	T_2	T_3		
BW (g/b)	11	32.16	32.48	32.32	0.231	0.88
	11-18	61.74^{b}	65.60^{a}	62.44^{b}	0.372	0.01
	11-25	101.02^{b}	105.84^{a}	101.00^{b}	0.599	0.05
	11-32	139.04^{b}	142.88^{a}	137.06^{b}	0.487	0.05
	11-39	174.68	177.28	171.84	1.155	0.286
	11-42	180.60	183.00	179.18	1.436	0.066

[Data refer to mean values of 10 birds per replicate from d11-42 days; Values (mean) bearing different superscripts in a row differ significantly at $^*P<0.05$; and $^{**}P<0.01$; T_1 refers to control diet (manually prepared), whereas T_2 and T_3 are ready-made diets procured from the market (Aman and Nourish company), respectively; SEM, standard error mean]

4.1.2 Feed intake

The result of the FI of broiler quail up to 42 days is shown in Table 8. The data showed that the FI of broiler quail was not influenced ($P>0.05$) by the dietary treatment. Numerically greater FI was observed in the T_2diet compared to the control or other group.

Table 8: Feed intake (FI) of broiler quail fed on a ready-made or manually prepared diet

Trait	Days	Treatment			SEM	P-value
		T_1	T_2	T_3		
FI (g/b/d)	11-18	8.48	9.29	7.36	0.207	0.12
	11-25	16.22	16.34	14.10	0.457	0.182
	11-32	20.47	22.10	21.83	0.285	0.192
	11-39	22.27	24.33	21.74	0.480	0.175
	11-42	23.75	24.89	23.88	0.550	0.735

[Data refer to mean values of 10 birds per replicate from d11-42 days; T_1 refers to the control diet (manually prepared), whereas T_2 and T_3 are ready-made diets procured from the market (Aman and Nourish company), respectively; SEM, standard error mean]

4.1.3 Feed conversion ratio (FCR)

The results showed that the FCR of quail was not influenced significantly (P>0.05) by dietary treatments during the 18th, 25^{th,} and 42nd days of age, respectively, except for the 32nd and 39th days only (Table 9). Significantly (P<0.05) lower or improved FCR values(2.15; 2.61) were observed in the T_2 diet group compared to another dietary group during 11-32 and 11-39 days of the trial period.

Table 9: Feed conversion ratio (FCR) of broiler quail fed on a ready-made or manually formulated diet

Trait	Days	Treatment			SEM	P-value
		T_1	T_2	T_3		
FCR	11-18	0.96	1.00	0.82	0.022	0.056
	11-25	1.72	1.55	1.63	0.037	0.301
	11-32	2.36^a	2.15^c	2.29^b	0.027	0.05
	11-39	2.86^a	2.61^c	2.71^b	0.0241	0.05
	11-42	3.69	3.45	3.57	0.042	0.177

[Data refer to mean values of 10 birds per replicate from d11-42 days; Data refer to mean values having uncommon superscript in a row that differ significantly at *P<0.05; T_1 refers to control diet (manually prepared), whereas T_2 and T_3 are ready-made diets procured from the market (Aman and Nourish company), respectively; SEM, standard error mean]

4.1.4 Livability of broiler quail

The response of broiler in terms of livability fed with ready-made or manually formulated diet on 42 days was not found significant (P>0.05) among treatments as shown below in Figure 12. The results showed that the numerically (P>0.05) highest survivability (100%) was found in all the treatment groups of broiler quail, respectively.

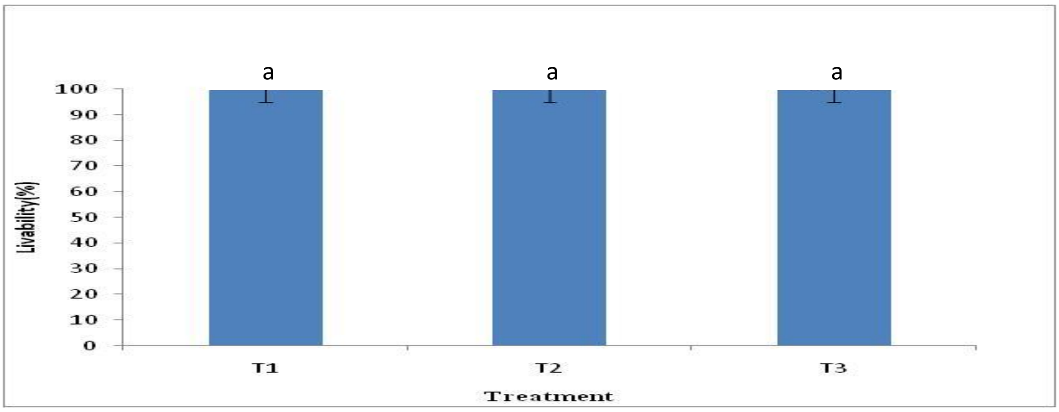

Fig 12: Livability (%) of quail fed ready-made versus manual fed from d11-42 days; Bar with the similar letter had no significant differences (P>0.05) between treatments

4.1.5 Carcass traits (%)

Results of meat yield parameters shown in Table 10 demonstrated that the relative weights of dressing %, breast weight, drumstick weight, thigh weight, wing weight, and neck weight %, etc., were not significantly different (P>0.05) between treatments by the dietary treatment except for back weight. Significantly higher (P<0.05) back weight (%) was found in the birds fed on the T2 diet group and the lowest back weight was on the T_1 diet.

Table 10: Carcass yield traits (%) of broiler quail fed ready-made versus manual fed from 42 days

Traits	Treatment			SEM	P-value
	T_1	T_2	T_3		
Dressing %	63.71	65.98	64.90	0.540	0.336
Breast weight %	24.24	24.66	23.10	0.469	0.498
Drumstick weight%	6..43	6.70	6.42	0.239	0.876
Thigh weight %	9.29	10.16	9.65	0.378	0.678
Wing weight %	4.85	4.65	4.66	0.482	0.982
Back weight%	14.02^c	16.80^a	16.08^b	0.206	0.05
Neck weight%	4.80	5.41	4.10	0.251	0.251

[Data refer to mean values of 4 birds per replicate on 42 days; Data refer to mean values having uncommon superscript in a row that differ significantly at *P<0.05; T_1 refers to control diet (manually prepared), whereas T_2 and T_3 are ready-made diets procured from the market (Aman and Nourish company), respectively; SEM, standard error mean]

4.1.6: Gastro-intestinal development

The relative weight of visceral organs of quails fed on the diet is shown in Table 11. The data showed that the weights of proventriculus, gizzard, liver, and heart weight of birds were identical (P>0.05) between treatments.

Table 11: Gastro-intestinal organ weight (g/b) of quail-fed readymade broiler feed and manually prepared feed on day 42

Traits	**Treatment**			**SEM**	**P-value**
	T_1	**T_2**	**T_3**		
Gizzard plus proventriculus	7.00	7.00	5.00	0.577	0.385
Heart weight	2.00	2.00	3.50	0.167	0.054
Liver weight	7.00	5.00	5.00	0.577	0.385

[Data refer to mean values of 4 birds per replicate on 42 days; T_1 refers to the control diet (manually prepared), whereas T_2 and T_3 are ready-made diets procured from the market (Aman and Nourish company), respectively; SEM, standard error mean]

4.1.7: Bone quality traits

The relative length, weight, and width of bone of broiler quail fed on manual and ready-made diets were shown in Table 12. The data showed that the weight of bone (tibia), and Ca% of quail was significant (P<0.05) among the treatments. The highest Ca% and tibia bone weight were found in the T2 diet group compared to others. Bone (tibia/femur) length, and width, tended to be significant (P<0.06).

Table 12: Bone quality traits of broiler quail fed ready-made versus manual fed from 42 days

Traits	Treatment			SEM	P-value
	T_1	T_2	T_3		
Femur weight (mg/b)	0.41	0.39	0.378	0.007	0.314
Femur length (mm/b)	40.37	41.20	40.40	0.123	0.058
Femur width (mm/b)	3.73	3.75	3.76	0.005	0.396
Tibia weight (mg/b)	0.51^b	0.53^a	0.46^c	0.009	0.05
Tibia length (mm/b)	40.37	41.20	40.40	0.123	0.056
Tibia width (mm/b)	3.53	3.58	3.55	0.003	0.06
Ca%	23.40^c	30.00^a	26.40^b	0.331	0.05
P%	50.00	51.15	51.20	0.284	0.354

[Data refer to mean values of 4 birds per replicate on 42 days; Data refer to mean values having uncommon superscript in a row that differ significantly at *P<0.05; T_1 refers to control diet (manually prepared), whereas T_2 and T_3 are ready-made diets procured from the market (Aman and Nourish company), respectively; Ca-calcium, P-phosphorus; SEM, standard error mean]

4.1.8: Cost-benefit analysis

The data on cost-benefit analyses of broiler quail was presented in Table 13. The higher profit and lowest cost ($P<0.01$) were found in the T_1 treatment group, and the lowest profit and highest cost were in the T_3 treatment group. The greater profit margin might result in reduced production costs per treatment group.

Table 13: Economic analyses of quail-fed readymade broiler feed and manually prepared feed

Parameters	Treatments			SEM	P-value
	T_1	T_2	T_3		
Live weight (g/b)	180.60	183.00	179.18	2.871	0.677
Livability (%)	100	100	100	-	-
Total production cost (Tk/kg live wt)	174.54^c	185.67^b	190.41^a	0.124	0.01
Live bird market price (Tk/ kg live bird)	200	200	200	-	-
Profit (Tk/kg)	25.46^a	14.33^b	9.59^c	0.077	0.01

[Detailed total cost of production is given in the appendix Table; Data refer to mean values having uncommon superscripts in a row that differ significantly at $^{**}P<0.01$]

Chapter-V

Discussion

5.1: The gross response of quail fed on readymade broiler feed and manually prepared feed from d1-42

Generally, the most important parameters for assessing broiler performance have been the growth rate, FCR, and carcass composition (Rezaei et al., 2004). The gross response in terms of feed intake, body weight, and FCR of broiler quail has been considered the primary criterion for determining the feed nutrient requirements because the broiler is an ideal experimental subject with limited nutrient storage, high nutrient demand, and rapid growth rate (Ammerman, 1995).The present study aimed to determine the effects of manual and ready-made feeds, and their relationships with growth performance, survivability, carcass yield traits, gastrointestinal development, bone morphology, and profitability of broiler quail. The supply of different compositional feed, formulation strategies, feed composition, feedstuffs, and feed forms of poultry diet has been known to influence productivity. The application of homemade and compound-ready feed has been the subject of studies on the improvement of weight gain and feed efficiency (Mahfuz and Piao, 2019).

5.1.1: Impact of home-made feed and ready commercial broiler ration on the feed intake of broiler quail

Feed intake of broiler quails in different dietary treatments during entire the trial period of the experimental periods was not affected by the dietary treatment. It indicates that broiler quail showed similar intention or preference or trend of consuming feed, regardless to supply them home-made or commercial broiler feed. A similar result was also reported by previous researchers (Berto et al., 2007; Gheisari et al., 2011; Ashour et al., 2015; Kar et al., 2017).

5.1.2: Effect of home-made feed and ready commercial broiler ration on the body weight of broiler quail

Our current study demonstrates that the dietary treatments had an impact on the body weight or live weight (LW) of broiler quail at the ages of d11-18, d11-25, and d11-32. Poorly significant variation in live weight (LW) was also noticed during d11-42 of age. Broiler fed on T_2 diet gained higher body weight than that of other dietary groups. It implies that source of manufacturing feed might enhance the growth performance of broiler quail. The increased feed utilization and better feed efficiency of the Japanese quail seemed to be the reasons for the improved body weight of the quail-fed readymade feed. Despite these, feed composition, nutritive value, growth promoters, antibiotics, taste appeal, manufacturing strategy, biological value, and digestibility of feed, protein level, and type of protein, nutrient availability, feed form, and feed choices including many other factors might be responsible for this growth performance of quail. However, the findings of the present study are consistent with those of earlier studies (Tserveni et al., 1986; Priti et al., 2014; Ashour et al., 2015; Nasr et al., 2017; Sangilimadan et al., 2018).

Many previous researchers reported that the growth responses of the broiler chickens were found to be influenced by ready-made broiler feeds from different feed mills when allowed to the birds (Roy et al., 2004, Hossain et al., 2006, Ghosh et al., 2019). Feed collected from different feed mills might vary in quality, composition, physical or external characters, palatability, flavor, odor, texture, color, presence of foreign particles (dust, stone), mold, nutritive value, and so on. These characteristics of poultry feed might affect the feed preference or performance of broilers adversely (Rose and Kyriazakis, 1991; Forbes and Shariatmadari, 1994).

5.1.3: Effect of home-made feed and ready commercial broiler ration on the feed conversion ratio (FCR) of quails

The FCR in different dietary treatments during the d11-32 and d11-39 of the experimental period was seen significantly different between treatments. Improved FCR was found in the birds fed the T_2 compound diet. At the end of the trial period, the numerically lowest FCR (3.45) value was found in the T_2 diet as well indicating that the best feed efficiency might occur due to efficient feed utilization, digestion, and absorption of feed nutrients. It seems that the broiler quail of the T_2 dietary group is a bit more efficient converter of feed to meat. The bird of this group grew better than that of other dietary groups and it might be as a result of better FCR or improved feed utilization. The current study's findings are consistent with those of earlier studies (Rajput et al., 2016; Sangilimadan et al., 2018). Besides, many previous investigators (Roy et al., 2004, Hossain et al., 2006, Ghosh et al., 2019) reported that FCR of the broiler chickens was found to be influenced by ready-made broiler feeds of different feed mills when allowed to the birds.

5.1.4: Effect of home-made feed and ready commercial broiler ration on the survivability of quails

The data on the livability or mortality of the quails fed either ready-made quail feed or manually prepared feed had no discernible impact on the birds' survival. The birds in all the dietary treatment groups had 100% viability. It is known that quail is very resistant to diseases naturally, so no diseases could affect them easily. It can be assumed that feed obtained from manual or ready–made commercial way had no detrimental effect on the viability of broiler quail for its proper growth and development of broiler. Our results are in agreement with the report of previous researchers (Roy et al., 2004, Hossain et al., 2006, Ghosh et al., 2019), who found similar results or insignificant differences in the viability of birds, when broiler chickens fed on different ready-made broiler diets. The findings of the current study showed significant mortality differences from those of the earlier studies (Gebhardt-Henrich et al., 1995; Kar et al., 2010; Roshdy et al., 2010; Dauda et al., 2014).

5.1.5: Effect of home-made feed and ready commercial broiler ration on the meat yield traits of broiler quail

From the data, it is obvious that there was no significant variation found in most of the dressing yields (dressing %, breast weight, thigh weight, neck, wing, drumstick weight %) of broiler quail except for back weight in this study. The increased back weight was found in the quail fed on the T_2 diet. The reason behind this might be a result of the increased body weight of quail in this group, as is seen in this study. The study's findings are consistent with those made by earlier researchers (Kumar et al., 2011; Narinc et al., 2014; Caron et al., 1990; Yalcin et al., 1995; Tserveni et al., 1986).

5.1.6: Gastro-intestinal development of quails

In the poultry industry, attaining the desired growth rate and efficiency is highly dependent on good intestinal health. There were no appreciable differences between the treatment groups of quail, according to the findings of the development of their gastrointestinal organs. It suggests that each group's internal organs developed in precisely the same way. But it was discovered that manually prepared feed did, in fact, slightly improve the heart, liver, and gizzard. Those findings are consistent with those of earlier studies (Ojedapo et al., 2014; Rajput et al., 2016; Kaye, 2014; Nasr et al., 2017).

5.1.7 Effect of home-made feed and ready commercial broiler ration on bone quality of broiler quail

There were no significant differences in the various bone characteristics of broilers between treatments, except for bone tibia weight and Ca%. However, birds in the T_2diet group had the significantly highest tibia bone weight (BW) and Ca%. Apart from this, bone femur and tibia length (TL) were also slightly increased in the broiler-fed T_2diet. The concentration of bone calcium (Ca %) was influenced by treatment. The higher BL and BW might be a result of better growth performance of broiler chicken fed a ready-made broiler diet, as is observed in this study. The discrepancy between these two results likely might occur due to many factors say, feed composition, dosages, nutritive value, bird' digestibility, feed choice, feed form, and so on.

5.1.8: The profitability of quail-fed readymade broiler feed and manually prepared feed

It was obvious from the result of economic data that a higher profit margin went to T_1 or a manually prepared diet than that of the ready-made commercial broiler diet used for this study. The reason is very clear that feed cost was the lowest for this group of quail compared to ready feed available in the market. Feed cost is the major cost for poultry production, more profit can be achieved in the poultry industry when feed cost is reduced. We know that the manufacturing cost of ready-made broiler feed is always higher than that of homemade mixed feed. So rearing quail with homemade feed appeared to be more profitable. Our findings concurred with those of the earlier researchers (Redoy et al., 2017; Siddique et al., 1996), who discovered comparable financial outcomes when quail were raised with ready-made feed.

To maximize quail production profits, the relationship between feed costs and subsequent chick costs as well as processing yield must be reviewed frequently. This is essential due to the fluctuating costs of feed, meat, and other expenses involved in producing quail. This variation is primarily caused by variations in the price of feed, how much feed is consumed, how much weight is gained, and the mortality rate. A feed-in diet that was manually prepared resulted in better financial results. The reduced feed consumption in the treated groups may be the cause of the lower feed cost. Higher net return was achieved in treated groups due to lower feed costs and higher gross returns.

Our findings are consistent with those of (Nasar et al., 2016), who fed Japanese quail a low-protein, low-energy diet and reported higher body weight gain rates and economic effectiveness.

Chapter-VI

Conclusion and recommendations

An overview of the results obtained in this study revealed that the body weight and FCR of quail were significantly improved in ready-made broiler feed without influencing feed intake and viability of quail. Only back weight amongst the other traits of the carcass yield was found to be significantly ameliorated in the quail when quail fed a ready-made broiler diet without affecting the relative weights of gastrointestinal organs. Amongst bone quality parameters, only bone tibia weight, length, width, femur length, and bone mineral mainly Ca% were found to be increased when quail were fed a ready-made broiler diet. It is interesting to note that the profit margin was significantly better for the birds which were fed homemade mixed feed than those of ready-made commercial broiler chicken feed available in the market. We know that the feed manufacturing cost of a ready-made broiler diet is always higher than that of homemade mixed feed. In fine, it can be concluded that rearing quail with homemade mixed feed appeared to be more profitable under farming conditions, even though ready-made broiler feed could show a better potential role for the growth performance and quality bone development of quail.

The study leads one to the conclusion that administering manually preparing feed to quails could increase quail output while at the same time resulting in significant cost savings. It may be more affordable to supplement quail feed with ready-made broiler feed and manually made feed because it has the potential to reduce feed costs and boost profitability. Additionally, it might increase the availability of feed for birds, which would raise quail productivity. To significantly increase quail output, more research may be needed on administering ready-made broiler feed and manually prepared feed due to the lack of available data.

Limitations of the study:

- Fewer research was conducted on this topic thus less number of literature is available
- Limited sample size because of fund availability
- Evaluation of meat quality (Proximate analysis, pH, cook loss, drip loss, amino acid, and fatty acid profile) not done
- A study of the quail immune condition (Titer level) and blood lipid profile was not done in this study.

Chapter-VII

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Chapter-VIII

Appendix

Table 1: Feed intake (FI) g/b of quail chicks fed readymade broiler feed and manually prepared feed

Treatments	No. of birds	FI(g/b)d11-18	FI(g/b)d18-25	FI(g/b)d25-32	FI(g/b)d32-39	FI(g/b)d39-42
T1	10	57.8	114.2	168.2	178	56.4
T1	10	54.6	120.8	153.2	157.2	74
T1	10	58.4	119.6	149	173.8	79.6
T1	10	61	116	153.2	162.6	79
T1	10	64.8	101.4	149.8	179.8	117
T2	10	63.8	102.2	152.2	153.8	72.4
T2	10	63	98	144	152	66.6
T2	10	56.6	96.2	147.2	157.2	62.4
T2	10	66.4	92.2	137.6	161.2	71
T2	10	75.2	103.4	135.4	155.2	63.4
T3	10	62.6	151.8	142.4	144.6	63.8
T3	10	54.6	114.4	141.8	154	75
T3	10	52.2	109.8	143	169.6	86.4
T3	10	47.4	99.6	145.6	176.6	112
T3	10	40.8	92	168.6	116	63.8

Table 2: Cost-benefit analyses of quail fed on readymade broiler feed and manually prepared feed

Items/parameters	Dietary treatments		
	T_1	T_2	T_3
Live weight (g/b) on the last day of trial (42nd day)	180.60	182.80	179.18
Livability (%) at the end of the trial	100	100	100
No. of birds' survivability/treat.	50	50	50
Feed intake (g/b) on 42nd day	474.97	449.805	456.915
Feed cost (Tk/kg) on an average	54.15	62.6	62
Total Feed intake (kg)	23.75kg (50 birds @474.97kg)	22.49 kg (50 birds @449.805kg)	22.85 kg (50 birds@456.915kg)
Total Feed cost (Tk)	23.75×54.15 =1286.06 Tk @ 54.15Tk	22.49 ×62.6=1407.874 Tk @ 62.6 Tk	22.85×62=1416.7 Tk @ 62 Tk
Total live weight (kg) of birds per treatment	50×180.6=9.03 kg	50×182.8 =9.14 kg	50×179.18=8.96kg
A). Feed cost (Tk/kg live weight)	1286.06/9.03= 142.42	1407.874/9.14= 153.94	1416.7/8.96= 158.04
11 Daysof age chick cost (Tk/bird)	27	27	27
B). 11 days of age chick cost (Tk/kg live bird)			
Other costs include:			
i) Vaccination cost (Tk)	0	0	0
ii) Medication cost(Tk)	10	10	10
iii) Disinfectant cost (Tk)	50	50	50
iv) Bulb & wire cost(Tk)	80	80	80
v) Water & Electricity cost(Tk)	50	50	50
vi) Transport cost(Tk)	100	100	100
Total other cost (Tk) [i…..vii]	290	290	290
Other costs (Tk/kg live wt)	290/9.03= 32.12	290/9.14= 31.73	290/8.96= 32.37
C). Other cost (Tk/kg live weight)	32.12	31.73	32.37
D).Total production cost (Tk / kg live wt.) [A+B+C]	174.54	185.67	190.41
E). Selling live bird market price (Tk /kg live bird)	200	200	200
Profit (Tk/kg live bird) [E-D]	25.46	14.33	9.59

Table 3: Livability (%) of Quails

Treat	1st week	2nd week	3rd week	4th week
T1	100	100	100	100
T1	100	100	100	100
T1	100	100	100	100
T1	100	100	100	100
T1	100	100	100	100
T2	100	100	100	100
T2	100	100	100	100
T2	100	100	100	100
T2	100	100	100	100
T2	100	100	100	100
T3	100	100	100	100
T3	100	100	100	100
T3	100	100	100	100
T3	100	100	100	100
T3	100	100	100	100

Table 4: Growth performance of quail-fed readymade broiler feed and manually prepared feed

Treat	No. of bird	Bwtd 11	Bwtd 11(g/b)	Bwtd 18	Bwtd 18(g/b)	Bwtd 25	Bwtd 25(g/b)	Bwtd 32	Bwtd 32(g/b)	Bwtd 39	Bwtd 39(g/b)	Bwt d 42	Bwtd 42(g/b)
T1	10	324	32.4	630	63	988	98.8	1382	138.2	1730	173	1762	176.2
T1	10	316	31.6	612	61.2	1034	103.4	1426	142.6	1716	171.6	1788	178.8
T1	10	314	31.4	610	61	1020	102	1388	138.8	1750	175	1838	183.8
T1	10	328	32.8	615	61.5	1010	101	1370	137	1726	172.6	1744	174.4
T1	10	326	32.6	620	62	999	99.9	1386	138.6	1812	181.2	1898	189.8
T2	10	330	33	680	68	1082	108.2	1460	146	1756	175.6	1798	179.8
T2	10	334	33.4	648	64.8	1060	106	1414	141.4	1656	165.6	1716	171.6
T2	10	314	31.4	660	66	1076	107.6	1422	142.2	1628	162.8	1704	170.4
T2	10	330	33	662	66.2	1062	106.2	1436	143.6	1790	179	1898	189.8
T2	10	316	31.6	630	63	1012	101.2	1412	141.2	1712	171.2	1754	175.4
T3	10	342	34.2	654	65.4	1050	105	1368	136.8	1722	172.2	1796	179.6
T3	10	312	31.2	622	62.2	1002	100.2	1364	136.4	1636	163.6	1732	173.2
T3	10	334	33.4	628	62.8	1032	103.2	1400	140	1802	180.2	1883	188.3
T3	10	318	31.8	596	59.6	1002	100.2	1386	138.6	1790	179	1836	183.6
T3	10	310	31	622	62.2	964	96.4	1336	133.6	1642	164.2	1712	171.2

Table 5: Meat yield Characteristics of quail-fed test diet on 42 days

Treatment	Live wt	Carcass wt	Dressing %	Breast wt	Drumstick wt	Thigh wt	Gizzard wt	Shank wt	Neck wt	Back wt	Wing wt	Heart wt	Liver wt	Head wt
T1	196	128	65.306	46	12	20	8	4	10	32	8	2	8	8
T1	178	116	65.168	46	12	18	6	4	8	28	10	2	6	6
T2	176	116	65.909	46	10	16	8	4	6	28	8	2	4	8
T2	192	120	62.5	44	12	20	6	4	8	30	10	2	6	10
T3	174	114	65.517	41	12	17	4	4	6	26	10	3	4	8
T3	168	108	64.286	38	10	16	6	4	8	24	6	4	6	8

Brief Bio-data of the Author

Md. Imrul Kayes Sujan was born on March 2, 1997, in the Manikganj district of Bangladesh. He is the son of Md. Mosharof Hossain and Sheuly Yesmin. In 2012, he achieve his Secondary School Certificate (SSC) from Madhabdi SP institution, Madhabdi, Narsingdi. In 2014, he got his Higher Secondary School Certificate (HSC) from Abdul Kadir Mollah City College, Narsingdi. He received his Doctor of Veterinary Medicine (DVM) degree from Chattogram Veterinary and Animal Sciences University (CVASU) in Bangladesh in 2019 (held in 2020) with a CGPA of 3.55. (Out of 4.00). Now, he is a candidate for a Master of Science (MS) in Poultry Science at the Department of Dairy and Poultry Science, CVASU. The author got a scholarship from NST for his MS research. He wants to work in the field of Poultry Science immensely.