
UNIT 3 FEEDING METHODS

Structure

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Different Methods of Feeding Poultry
 - 3.2.1 *Ad libitum* Feeding
 - 3.2.2 Controlled Feeding
 - 3.2.3 Restricted Feeding
 - 3.2.4 Phase Feeding
 - 3.2.5 Supplementary Feeding
- 3.3 Feeding in Extreme Weather Conditions
 - 3.3.1 Cold Weather
 - 3.3.2 Hot Weather
- 3.4 Feeding of Broiler and Layer Chicken
 - 3.4.1 Broiler Chicken
 - 3.4.2 Layer Chicken
- 3.5 Feeding of other Birds
 - 3.5.1 Duck
 - 3.5.2 Guinea Fowl
 - 3.5.3 Japanese Quail
 - 3.5.4 Turkey
- 3.6 Let Us Sum Up
- 3.7 Glossary
- 3.8 Suggested Further Reading
- 3.9 References
- 3.10 Answers to Check Your Progress

3.0 OBJECTIVES

After studying this unit, you will be able to:

- discuss about different methods of feeding poultry;
- know about feeding in different weather conditions; and
- summarize the feeding of broilers, layers and other birds.

3.1 INTRODUCTION

Feeding of poultry is a job to be taken seriously. It needs special skill to offer balanced and complete feed to different age groups of chicken and other domestic birds. The requirement of nutrients, inclusion level and nutrient composition of feed ingredients vary due to several factors. As an alternate to chickens, ducks, guinea fowls, quails and turkeys are reared on small and large farms. Each of them needs a specific complete feed having variable nutrients but balanced in every aspect. A brief account of feeding of all these species of poultry is discussed here.

3.2 DIFFERENT METHODS OF FEEDING POULTRY

Feeding of grains is not an appropriate way of feeding the birds as it would not provide the entire required nutrient for growth and production of bird. Similarly, finely powdered meal is not the most desirable method for feeding of birds. Thus, a well-balanced ration improperly fed will not give the most satisfactory results unless proper method is followed.

3.2.1 *Ad libitum* Feeding

Also called free choice feeding or full feeding and is very easy to manage. Feed is available at all time and the bird can eat at its own will and regulates its total in-take. Mostly practiced in broiler chicken where the maximum body weight is the ultimate goal for rearing the birds. Such practice may lead to obesity in broilers and layers.

3.2.2 Controlled Feeding

Also known as forced feeding. Attempted for a short while in first week when the turkey poults/young chicks do not learn or try to pick up their feed. May be employed in other species if feed and water are denied for more than 36 hours to prevent body dehydration.

3.2.3 Restricted Feeding

In order to avoid obesity on account of full feeding, restricted feeding programme is therefore, recommended for some strains of broiler or laying breeders. In cases of broiler, chicks preferably after 18 days are subjected to restricted feeding up to 30-35 days of age in order to check the prolific body growth resulting into physiological and metabolic disease syndromes like Ascites, Cardio-respiratory failure etc. Over restriction of feed is also harmful and can result in very late maturity resulting in unsatisfactory production. **Advantages:** (a) Delayed sexual maturity from few days to 3 or 4 weeks; (b) Reduces body weight and amount of body fat; (c) Cost of raising pullets is reduced; (d) There is a better livability during egg production; and (e) Egg weight is regulated towards production of larger eggs.

Methods: The different methods of restricted feeding include:

- (a) **Limited Everyday-Feeding Programme:** The birds are given a measured quantity of feed each day but less than they would eat, if fully fed.
- (b) **Skip-a-day Feeding (Limited Access):** The birds are fed every other day and the amount of feed given on feeding days must be regulated to twice the amount of feed allocated on the limited every day programme.
- (c) **Varying Nutrient Density:** Restriction of nutrient intake is done by diluting the nutrient density of ration. This can be done either by reducing the energy in-take, protein restriction; latter is based on the idea that laying birds have different nutritional needs at different phases of their productive life.

3.2.4 Phase Feeding

Phase feeding is generally practised for energy restriction. The energy requirement for laying hen varies from 310 kcal/day in severe winter to 265 kcal/day in summer. Thus, phase feeding refers to:

- (a) changes in the laying hen's diet;
- (b) adjust to age and state of production;
- (c) adjust for season of the year and for temperature and climatic changes;
- (d) account for difference in body weight and nutrient requirement of different strains of birds; and
- (e) adjust for one or more nutrients as other nutrients are changed for economic and availability reasons.

In phase feeding, high protein feed (usually 18-19%) is given from onset of egg production to peak production period. Therefore, a low level of protein (about 16%) is fed for the next 5 or 6 months, followed by still lower level (usually 15%) until the laying period is completed. Phase feeding thus helps to reach higher peak production and sustain it longer. It is known that the requirement of calcium increases while that of phosphorus decreases with each succeeding phase. Laying type birds are maintained even up to 80 weeks of age. The production cycle is divided into three stages (popularly called phases):

(i) Phase-I

From the age of 22 to 36 weeks, the birds are expected to reach from zero to peak egg production of 85 %. This further is accompanied by increase in body weight by 500 g and increase in size of eggs from 40 to 60 g. Therefore, the first phase of reproduction is critical for maximum egg production and tissue development. Thus, the energy content of poultry ration should be adjusted to supply required quantity of protein.

(ii) Phase-II

It is the period from 37 to 56 weeks when hens have attained mature body weight and egg production has not gone below 60 %. The eggs produced are larger and efficiency of protein utilization is approximately 56 % during this phase.

(iii) Phase-III

It ranges from 57 to 80 weeks of age when the production declines but the body weight and egg weight slightly increases or till the spent birds are discarded. During this phase, egg production is less than 60 %. Requirements of proteins are reduced particularly in this phase.

3.2.5 Supplementary Feeding

May be practiced with calcium supplements. Very common in breeder or commercial layers. Ca supplement (oyster shell or shell grit) may be placed in separate feeder @ 3 to 5 g per bird per day in late evening hours. Ca intake in late hours of the day is lodged in the gizzard and it slowly gets dissolved by the action of hydrochloric acid produced in proventriculus and thus the Ca would be available for egg shell formation which takes place in the dark hours when feeding activity is not there.

Check Your Progress 1

Note: a) Use the space given below for your answers.

- b) Check your answers with those given at the end of the unit.

- 1) Write True or False
 - i) *Ad libitum* feeding is also known as free choice feeding.
 - ii) Controlled feeding is not a feeding system.
 - iii) Feed is always available in full feeding.
 - iv) Feed is restricted in full feeding.
 - v) Full feeding is very common.
- 2) What is phase feeding?
.....
.....
- 3) What are the advantages of restricted feeding?
.....
.....

Activity 1

Visit a nearby poultry farm and note down the method of feeding practiced for different types of poultry at different age groups. Give your opinion and comments on the feeding method practiced in the farm you visited.

.....
.....
.....

3.3 FEEDING IN EXTREME WEATHER CONDITIONS

The chicken is a homeothermic i.e. it can maintain a relatively constant body temperature, provided the environmental temperature is not outside a certain range. It is obvious that birds kept at low temperature will require more dietary energy to maintain body temperature than the ones kept at high temperature. The ideal temperature range for poultry is between 13 to 30°C. Birds stop eating when the temperature is above 30°C, whereas, if the temperature is below 13°C, birds over-eat to meet energy needs. Both extremes can result in increased cost for production of poultry meat and egg. In a country as large as India, with varying climates, the feed consumption varies considerably which affects the nutrient intake. Almost all the nutrient requirements of poultry vary as per the season.

3.3.1 Cold Weather

As temperature drops, the birds need more calories of energy to maintain their body temperature. When birds consume more feed, the protein and other nutrient intake will be more along with the energy. Alternatively, the protein and other nutrient content of the ration can be reduced keeping the energy at same level. For broilers, a protein level of 26 % was found to be optimum in the monsoon season but the energy requirement remains the same at 3100 kcal ME/kg. For optimum growth of white leghorn, chicks required 22 % crude protein with 2700 kcal ME/kg in summer, while in winter they required higher energy level (3000 kcal ME/kg).

3.3.2 Hot Weather

As the temperature increases, the feed intake declines. The rate of decline in feed consumption might be 1.5 % per degree rise in temperature from 20° to 30° C, whereas, this fall in feed intake may be 4-5 % per degree rise in temperature from 30° to 38°C. At higher temperature, the birds need a lesser amount of energy, though the requirement of other nutrients remains almost unaltered. When the temperature rises above 30°C, the birds start showing higher respiration rate and subsequently pant (open mouthed breathing) to dissipate the heat by increasing evaporative loss. Reduced feed intake and growth have been noticed in broilers due to heat stress. On the other hand, reduced feed intake, egg production, egg size and egg shell quality are observed in layers during heat stress. You may increase calcium supply from 4 g per bird per day to 5 g per bird per day in summer. Provision of extra calcium during afternoon. Calcium of granular texture i.e. shell grit of 1 mm size may be provided to layers in the afternoon or evening so that the same may be stored in gizzard and utilized for egg shell formation in night. Higher levels of phosphorus in diet are deleterious at elevated temperature. Therefore, never increase phosphorus level. Increase dietary electrolytes (Chlorine, Potassium and Sodium) by 1.5% per one degree Celsius above 27°C. There are reports that there is a higher requirement of Vitamin A in hot climates. Higher temperature may also interfere with optimum synthesis of Vitamin C. Vitamin C supplementation (200 to 600 mg/ kg diet) in layer ration under high environmental temperature improves both eggshell quality and production. Increase Vitamin D and E by 1.2 to 1.5 times in heat stress.

Check Your Progress 2

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

1) Explain about the feeding of birds during cold weather?

.....

2) How the hot weather affects the feed intake of birds?

.....

3) What are the effects of heat stress in layers and broilers?

.....

3.4 FEEDING OF BROILER AND LAYER CHICKEN

Feeding of broiler and layer chicken differ because of differences in the requirement of nutrients. This section deals with the feeding of broilers and layers at different stages and age groups.

3.4.1 Broiler Chicken

Broiler stocks have been developed that grow at a rapid rate and can reach about 1.8 to 2.0 kg at 6 weeks of age with an FCR of 1.8 kg on whole mash with 90% dry matter or 1.65 kg on pellet feed with 96% dry matter. The basic objectives of broiler feeding are:

- (a) Good growth
- (b) Good feed conversion ratio (FCR)
- (c) Good skeletal health and survivability
- (d) Quality meat in a shorter period of time

(i) Growth phases

The basic purpose of phasing out is to provide nutrients as per need depending upon the growth rate and type of growth. The broilers are generally reared under the following phases:

- a) **Starting phase (0-3 weeks):** Also known as starter phase. Growth is at the fastest rate (about 15 to 20 times of initial body weight) which is mainly due to deposition of protein and minerals. FCR of the young chick (0 to 3 weeks of age) is largely dependent upon adequate amino acid nutrition.
- b) **Finishing phase (4-6 weeks):** Also known as finisher phase. Growth rate is about 2 to 3 times of its weight on 21st day and the growth is mainly due to deposition of protein, minerals and fat. FCR in the older broilers (4-6 weeks of age) is more dependent upon dietary metabolizable energy.
- c) **Larger broilers or roasters (7-8 weeks):** Growth of protein and minerals continues but their rate of deposition is decreased, while fat deposition rate is further increased. The large broilers are suitable for production of different value added products.

(ii) Suggested nutrients

You may refer for different nutrient requirements of broilers discussed in Unit 1 of this block. Besides BIS (1992) recommendations, a few suggested practical levels of some common nutrients in the diets of broiler starter and finisher chicken based on indigenous work are detailed in Table 3.1.

Table 3.1: Suggested Levels of Some Common Nutrients in Feeds for Broiler Chicken

Nutrients	BIS (1992)		Suggested	
	Broiler Starter (0-3 weeks)	Broiler Finisher (4-6 weeks)	Broiler Starter (0-3 weeks)	Broiler Finisher (4-6 weeks)
Energy, kcal ME/kg	2800	2900	2900	3000
Protein, %	23	20	22	20
Lysine, %	1.2	1.0	1.1	0.9
Methionine, %	0.5	0.4	0.4	0.3
Calcium, %	1.2	1.2	1.0	0.9
Available Phosphorus, %	0.5	0.5	0.4	0.4
Vitamin A, IU/kg	6000	6000	5000	4000
Vitamin B ₂ , mg/kg	6	6	5	4
Vitamin D ₃ , ICU/kg	600	600	500	400

(iii) Feeding management

Broiler chicks are fed *ad libitum* from day-old to age of sacrifice. Frequent feeding (two to three times) of broilers is beneficial not only to encourage feed intake but also to prevent feed wastage. A whole mash feeding or pellet/crumble feeding is followed.

(iv) Diet composition

For your comprehensive understanding, some suggested formulae for broiler starter and finisher rations are given in Table 3.2.

Table 3.2: Suggested Diet Composition for Broiler Starter and Finisher Chicken

Ingredients (kg/100 kg)	Broiler Starter (0-3 weeks)		Broiler Finisher (4-6 weeks)	
	1	2	1	2
Bajra (Pearl Millet)	-	14.0	13.0	8.0
Bone Meal	1.0	1.0	1.0	1.0
Dicalcium phosphate	0.5	0.5	0.5	0.5
Fish Meal	5.0	-	-	2.0
Limestone	1.0	1.0	1.0	1.0
Maize	50.0	46.0	50.0	50.0
Maize Gluten Meal	6.0	4.0	-	3.0
Meat Meal	5.0	7.0	7.0	-
Mineral+Vitamin Premix*	0.2	0.2	0.2	0.2
Mustard Cake	5.0	9.0	6.0	2.0
Rice Polish	12.0	4.0	2.0	11.0
Salt	0.3	0.3	0.3	0.3
Soybean Meal	14.0	10.0	15.0	15.0
Animal Fat	-	3.0	4.0	6.0
Total	100.0	100.0	100.0	100.0

*Mineral mixture to contain per kg diet: Copper sulphate 15 mg; Ferrous sulphate 200 mg; Manganese sulphate 250 mg; Potassium iodate 1 mg; Zinc sulphate 250 mg.

*Vitamin mixture to contain per kg diet: Vitamin A 8000 IU; Vitamin B₂ 4 mg; Vitamin D₃ 1000 ICU.

3.4.2 Layer Chicken

The basic objectives of feeding to laying type birds (White Leghorn) are: (a) Good growth; (b) Good FCR; (c) Good skeletal health and survivability; (d) Attaining sexual maturity at a given weight and time with minimum nutritional input; and (e) improving egg production.

(i) Growth phases

The basic purpose of phasing out is to provide nutrients as per need depending upon the growth rate and type of growth. For example: (a) Breeders - hens for production of fertile eggs for hatching of chicks. (b) Layers - hens for production of table eggs for consumption of human being. The body weight and nutrient requirements are almost similar for both the groups except certain micronutrients, which are given in excess in breeder diets.

The layers are generally reared in three phases:

- Starter** (0 to 8 weeks): Young chicks need more of body building nutrients in their ration. There is a greater need of protein for growth of tissues and feathers.
- Grower** (9 to 20 weeks): The rate of growth is slowed down during this period, but chicks need enough nutrients for proper body development and reserves for the subsequent laying period.
- Layer** (21 weeks & above): During the early period of laying, a young pullet must consume sufficient amount of all nutrients to allow her to produce: (a) eggs at a maximum rate; (b) to maintain her body weight; (c) eggs of bigger/optimum size; (d) reserve nutrients in the body against stress and diseases; and (e) requirements of Ca increases significantly with increased rate of egg laying.

(ii) Suggested nutrients

You may refer for different nutrient requirements of egg type chicken discussed in Unit 1 of this block. Some suggested practical levels of some common nutrients in the diets of laying type birds, grower and layer chickens are detailed in Table 3.3.

Table 3.3: Suggested Practical Levels of Common Nutrients in Feeds for Egg Type Chicken

Nutrients	BIS (1992)			Suggested		
	Starter (0-8 weeks)	Grower (9-20 weeks)	Layer (21 weeks & above)	Starter (0-8 weeks)	Grower (9-20 weeks)	Layer (21 weeks & above)
Energy, kcal ME/kg	2600	2500	2600	2700	2500	2700
Protein, %	20	16	18	20	15	17
Lysine, %	0.9	0.7	0.9	0.9	0.6	0.7
Methionine, %	0.6	0.5	0.6	0.5	0.4	0.5
Calcium, %	1.0	1.0	3.0	1.0	0.9	3.0
Available Phosphorus, %	0.5	0.5	0.5	0.5	0.4	0.5
Vitamin A, IU/kg	6000	6000	8000	5000	4000	7000
Vitamin B ₂ , mg/kg	6	5	5	5	4	6
Vitamin D ₃ , ICU/kg	600	600	1200	500	400	1000

(iii) Feeding management

Breeders have somewhat increased requirement of nutrients especially trace minerals and vitamins as besides egg production, fertility and hatchability of egg is also important.

(iv) Diet composition

For your comprehensive understanding, some suggested formulae for egg type starter, grower and layer practical rations are given in Table 3.4.

Table 3.4: Suggested Diet Composition for Egg Type Chicken

Ingredients (kg/100 kg)	Starter (0-8 weeks)		Grower (9-20 weeks)		Layer (21 weeks & above)	
	1	2	1	2	1	2
Bajra	10.0	20.0	5.0	20.0	21.0	16.0
Bone Meal	1.0	1.0	1.0	1.0	1.0	1.0
Dicalcium Phosphate	0.5	0.5	0.5	0.5	0.5	0.5
Fish Meal	5.0	-	3.0	-	5.0	-
Limestone Powder	1.0	1.0	1.0	1.0	4.0	4.0
Maize	50.0	36.0	30.0	40.0	46.0	51.0
Maize Gluten Meal	-	3.0	-	-	4.0	5.0
Meat Meal	5.0	5.0	-	-	-	4.0
Mineral+Vitamin Premix*	0.2	0.2	0.2	0.2	0.2	0.2
Mustard Cake	-	-	10.0	-	-	6.0
Rice Kani	-	16.0	20.0	11.0	5.0	5.0
Rice Polish	15.0		16.0	9.0	-	-
Salt	0.3	0.3	0.3	0.3	0.3	0.3
Soybean Meal	12.0	10.0	4.0	8.0	7.0	-
Sunflower Cake	-	7.0	9.0	9.0	6.0	7.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Mineral mixture to contain per kg diet: Copper sulphate 15 mg; Ferrous sulphate 200 mg; Manganese sulphate 250 mg; Potassium iodate 1 mg; Zinc sulphate 250 mg.

*Vitamin mixture to contain per kg diet: Vitamin A 8000 IU; Vitamin B₂ 4 mg; Vitamin D₃ 1000 ICU.

Check Your Progress 3

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

1) What are the different growth phases of broilers?

.....

2) What are the different growth phases of layers?

.....

Activity 2

Visit a nearby poultry farm and note down the types of feed used along with their composition for feeding of birds of different growth phases of broilers and layers.

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3.5 FEEDING OF OTHER BIRDS

Tremendous growth of poultry sector in our country has been attributed primarily to chicken. However, there are some more species that can be reared commercially for production of eggs and meat as these have potential to become a significant source of food for the masses and also a source for substantial supplementary income. These include duck, guinea fowl, quail and turkey.

3.5.1 Duck

Duck has been occupying an important place next to chicken for meat and egg production as the duck farming is easier and feeding procedure is also simple. Among many breeds, Indian Runner, Khakhi Campbell and White Pekin are more popular. Best ducks lay more eggs in number per bird per year than chickens.

(i) Growth phases

As per the age groups, the meat type ducks are grouped in 2 phases such as Broiler starter (0-2 weeks) and Broiler finisher (3-8 weeks), whereas, the egg type ducks are grouped into 3 phases viz. Starter (0-8 weeks), Grower (9-20 weeks) and Layer (21 weeks onwards).

(ii) Suggested nutrients

Based on few reports available, practical levels of some common nutrients required for meat and laying type ducks are suggested in Table 3.5.

Table 3.5: Suggested Practical Levels of Some Common Nutrients in Feeds for Duck

Nutrients	Meat Type Duck		Egg Type Duck		
	Starter (0-2 weeks)	Finisher (3-8 weeks)	Starter (0-8 weeks)	Grower (9-20 weeks)	Layer (21 weeks & Above)
Energy, kcal ME/kg	2800	2900	2700	2500	2700
Protein, %	22	20	20	15	17
Lysine, %	1.1	1.0	0.9	0.7	0.8
Methionine, %	0.5	0.4	0.5	0.4	0.5
Calcium, %	1.0	0.8	1.0	0.8	3.0
Available Phosphorus, %	0.5	0.4	0.5	0.4	0.5
Vitamin A, IU/kg	6000	5000	6000	5000	7000
Vitamin B ₂ , mg/kg	6	5	6	5	6
Vitamin D ₃ , ICU/kg	600	500	600	500	100

(iii) Feeding management

Ducks have natural tendency for foraging. Hence, they are widely reared in rice growing areas. Ducks reared in open range system eat feed comprised of fallen paddy grains, small fishes, snails, insects, earthworms and green tender leaves/grasses. After returning back, they are given supplementary feeds like paddy grains, rice polish, rice bran, wheat bran, thrashed fishes etc. Crumbles and pellets (3-8 mm size) are the best forms of feed as supplements over and above. Usually, wet mash is given 4-5 times daily for ducklings.

(iv) Diet composition

A few feed formulae employing practical feed ingredients for meat and egg type ducks are presented in Table 3.6 and 3.7, respectively.

Table 3.6: Suggested Diet Composition for Meat Type Duck

Ingredients (kg/100 kg)	Broiler Starter (0-2 weeks)		Broiler Finisher (3-8 weeks)	
	1	2	1	2
Bajra (Pearl Millet)	11.0	-	17.0	9.0
Bone Meal	1.0	1.0	1.0	1.0
Dicalcium phosphate	0.5	0.5	0.5	0.5
Fish Meal	4.0	5.0	10.0	10.0
Groundnut Cake	11.0	-	9.0	-
Limestone	1.0	1.0	1.0	0.6
Maize	47.0	44.0	32.0	50.0
Maize Gluten Meal	4.0	7.0	-	5.0
Meat Meal	4.0	-	-	-
Mineral+Vitamin Premix*	0.2	0.2	0.2	0.2
Mustard Cake	-	7.0	-	5.0
Rice Polish	6.0	20.0	16.0	10.0
Salt	0.3	0.3	0.3	0.3
Soybean Meal	10.0	8.0	5.0	5.0
Sunflower Cake	-	6.0	8.0	4.0
Total	100.0	100.0	100.0	100.0

*Mineral mixture to contain per kg diet: Copper sulphate 15 mg; Ferrous sulphate 200 mg; Manganese sulphate 250 mg; Potassium iodate 1 mg; Zinc sulphate 250 mg.

*Vitamin mixture to contain per kg diet: Vitamin A 8000 IU; Vitamin B₂ 4 mg; Vitamin D₃ 1000 ICU.

Table 3.7: Suggested Fiet Composition for Laying Type Duck

Ingredients (kg/100 kg)	Starter (0-8 weeks)		Grower (9-20 weeks)		Layer (21 weeks & Above)	
	1	2	1	2	1	2
Bajra (Pearl Millet)	8.0	10.0	5.0	14.0	9.0	16.0
Bone Meal	1.0	1.0	1.0	1.0	1.0	1.0
Dicalcium Phosphate-DCP	0.5	0.5	0.5	0.5	0.5	0.5
Fish Meal	8.0	-	5.0	-	5.0	-
Groundnut Cake	10.0	-	8.0	-	11.0	-
Limestone Powder	1.0	1.0	1.0	1.0	3.0	4.0
Maize	34.0	40.0	34.0	28.0	43.0	39.0
Maize Gluten Meal	3.0	8.0	-	-	-	8.0
Meat Meal	5.0	5.0	-	6.0	-	6.0
Mineral+Vitamin Premix*	0.2	0.2	0.2	0.2	0.2	0.2
Mustard Cake	-	-	5.0	-	10.0	-
Rice Polish	20.0	17.0	36.0	40.0	10.0	15.0
Salt	0.3	0.3	0.3	0.3	0.3	0.3
Soybean Meal	5.0	10.0	-	9.0	7.0	8.0
Sunflower Cake	4.0	7.0	4.0	-	-	2.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Mineral mixture to contain per kg diet: Copper sulphate 15 mg; Ferrous sulphate 200 mg; Manganese sulphate 250 mg; Potassium iodate 1 mg; Zinc sulphate 250 mg.

*Vitamin mixture to contain per kg diet: Vitamin A 8000 IU; Vitamin B₂ 4 mg; Vitamin D₃ 1000 ICU.

3.5.2 Guinea Fowl

The guinea fowl ranks third in population after chicken and duck in the country. Among three varieties such as Pearl, Lavender and White, the pearl guinea fowl are most common among village stock. The guinea fowl may be raised in traditional extensive system and modern intensive system in rural and urban zones, respectively. The bird is primarily reared for meat production.

(i) Growth phases

As per the age groups, the guinea fowl are grouped in 4 phases such as Starter (0-4 weeks), Finisher (5-12 weeks), Grower (13-20 weeks) and Breeder and Layer (21 weeks & above). Mostly, for meat purpose, the guinea fowls are reared upto 12 weeks of age. The guinea fowl is known for its slow growth in comparison to chicken. The mean body weight of guinea fowl at 12 weeks of age has been reported to be around 800-900 g. It has been observed that like other poultry species, the feed intake increased with age of guinea fowl. At 2 weeks of age, the keets (young chicks) consumed 10 g feed per day, whereas, this quantity increases to 50 g feed at 8 weeks of age. The laying birds consume 80 g feed per day. If you are rearing guinea fowl in intensive system, you should offer balanced feed to guinea fowl. The feeding cost in guinea fowl comes higher than that of chicken due to lower growth rate and poor feed conversion. Guinea fowls start laying eggs around 36-38 weeks of age and lay about 60-100 eggs during the year, while the improved varieties start laying at 28-30 weeks and lay 140-160 eggs per year.

(ii) Suggested nutrients

Based on research work carried in our country, the suggested nutrient requirements of guinea fowl have been shown in Table 3.8.

Table 3.8: Suggested Practical Levels of Some Common Nutrients in Feeds for Guinea Fowl

Nutrients	Starter (0-4 weeks)	Finisher (5-12 weeks)	Grower (13-20 weeks)	Layer (21 weeks & Above)
Energy, kcal ME/kg	2700	2900	2700	2800
Protein, %	22	20	17	18
Lysine, %	1.1	0.9	0.7	0.8
Methionine, %	0.5	0.4	0.4	0.5
Calcium, %	1.0	0.9	1.0	3.5
Available Phosphorus, %	0.6	0.5	0.5	0.7
Vitamin A, IU/kg	5000	5000	4000	7000
Vitamin B ₂ , mg/kg	6	4	4	6
Vitamin D ₃ , ICU/kg	600	600	600	1000

(iii) Feeding management

The guinea fowl in intensive rearing system needs balanced compounded diets similar to that of chicken. The feeding cost is usually higher in comparison with chicken due to lower growth rate and poor feed conversion. On free range system, a protein level of 16% for an adult guinea fowl with supplementary feeding of crop residue, green, household waste and insects etc. will be sufficient.

(iv) Diet composition

A few feed formulae employing practical feed ingredients for guinea fowl has been presented in Table 3.9.

Table 3.9: Suggested Diet Composition for Guinea Fowl

Ingredients (kg/100 kg)	Starter (0-4 weeks)		Finisher (5-12 weeks)		Grower (13-20 weeks)		Layer (21 weeks and Above)	
	1	2	1	2	1	2	1	2
Bajra (Pearl Millet)	5.0	-	17.0	6.0	10.0	14.0	9.0	9.0
Bone Meal	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dicalcium phosphate	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Fish Meal	10.0	5.0	10.0	8.0	5.0	-	5.0	-
Groundnut Cake	11.0	-	9.0	-	8.0	-	11.0	-
Limestone Powder	1.0	1.0	1.0	1.0	1.0	1.0	3.0	4.0
Maize	43.0	43.0	37.0	45.0	34.0	20.0	35.0	35.0
Maize Gluten Meal	5.0	7.0	-	5.0	-	-	5.0	8.0
Meat Meal	-	-	-	-	-	6.0	-	6.0
Mineral+Vitamin Premix*	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Mustard Cake	-	7.0	-	5.0	5.0	-	6.0	-
Rice Polish	10.0	15.0	16.0	15.0	20.0	30.0	6.0	25.0
Salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Soybean Meal	6.0	9.0	-	8.0	5.0	10.0	8.0	-
Sunflower Cake	7.0	6.0	8.0	-	5.0	7.0	-	11.0
Wheat Bran	-	5.0	-	5.0	5.0	10.0	10.0	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Mineral mixture to contain per kg diet: Copper sulphate 15 mg; Ferrous sulphate 200 mg; Manganese sulphate 250 mg; Potassium iodate 1 mg; Zinc sulphate 250 mg.

*Vitamin mixture to contain per kg diet: Vitamin A 8000 IU; Vitamin B₂ 4 mg; Vitamin D₃ 1000 ICU.

3.5.3 Japanese Quail

Japanese quail provides better means of diversification to chicken dominated poultry industry and is suitable to marginal and landless farmers. Smaller size, rapid growth rate (marketable at 5-6 weeks), early onset of egg production (6 weeks), disease resistance, low capital outlay makes the quail very much suitable for commercial farming.

(i) Growth phases

As per the age groups, the meat type quails are grouped in 2 phases such as Broiler starter (0-2 weeks) and Broiler finisher (3-5 weeks), whereas, the egg type quails are grouped into Starter (0-2 weeks), Grower (3-5 weeks) and Breeder and Layer (6 weeks onwards).

(ii) Suggested nutrients

Based on indigenous research, the practical levels of common nutrients for meat and egg type Japanese quail are detailed in Table 3.10.

Table 3.10: Suggested Practical Levels of Some Common Nutrients in Feeds for Japanese Quail

Nutrients	Meat Type Quail		Egg Type Quail		
	Starter (0-2 weeks)	Finisher (3-5 weeks)	Starter (0-2 weeks)	Grower (3-5 weeks)	Layer (6 weeks & Above)
Energy, kcal ME/kg	2800	2900	2800	2700	2700
Protein, %	26	24	24	19	20
Lysine, %	1.3	1.1	1.0	0.9	0.9
Methionine, %	0.5	0.4	0.4	0.3	0.4
Calcium, %	0.8	0.7	0.9	0.6	3.0
Available Phosphorus, %	0.4	0.3	0.4	0.3	0.5
Vitamin A, IU/kg	8000	7000	8000	7000	8000
Vitamin B ₂ , mg/kg	6	5	6	5	6
Vitamin D ₃ , ICU/kg	1200	1000	1200	1000	1200

(iii) Feeding management

The starter period needs special feeding management as the chicks have to gain more body weight in this phase. The feeding trough should never be filled up full in order to avoid feed wastage. In egg type quails, the average daily feed intake is about 25 g. The daily water intake is 1.7 to 2.3 times of feed intake.

(iv) Diet composition

A few feed formulae employing common feed ingredients for meat and egg type quails are listed in Table 3.11 and 3.12, respectively.

Table 3.11: Suggested Diet Composition for Meat Type Japanese Quail

Ingredients (kg/100 kg)	Broiler Starter (0-2 weeks)		Broiler Finisher (3-5 weeks)	
	1	2	1	2
Bajra (Pearl Millet)	-	7.0	7.0	-
Bone Meal	1.0	1.0	1.0	1.0
Dicalcium phosphate	0.5	0.5	0.5	0.5
Fish Meal	6.0	8.0	10.0	10.0
Groundnut Cake	5.0	-	9.0	5.0
Limestone Powder	1.0	1.0	1.0	-
Maize	36.0	40.0	37.0	40.0
Maize Gluten Meal	10.0	7.0	7.0	10.0
Mineral+Vitamin Premix*	0.2	0.2	0.2	0.2
Mustard Cake	10.0	7.0	-	9.0
Rice Polish	8.0	6.0	12.0	10.0
Salt	0.3	0.3	0.3	0.3
Soybean Meal	15.0	12.0	10.0	10.0
Sunflower Cake	7.0	10.0	5.0	4.0
Total	100.0	100.0	100.0	100.0

*Mineral mixture to contain per kg diet: Copper sulphate 15 mg; Ferrous sulphate 250 mg; Manganese sulphate 300 mg; Potassium iodate 1 mg; Zinc sulphate 300 mg.

*Vitamin mixture to contain per kg diet: Vitamin A 8000 IU; Vitamin B₂ 5 mg; Vitamin D₃ 1000 ICU.

Table 3.12: Suggested Diet Composition for Egg Type Japanese Quail

Ingredients (kg/100 kg)	Starter (0-2 weeks)		Grower (3-5 weeks)		Layer (6 weeks- Above)	
	1	2	1	2	1	2
Bajra (Pearl Millet)	7.0	5.0	12.0	14.0	5.0	11.0
Bone Meal	1.0	1.0	1.0	1.0	1.0	1.0
Dicalcium phosphate	0.5	0.5	0.5	0.5	1.0	1.0
Fish Meal	6.0	5.0	5.0	7.0	5.0	5.0
Groundnut Cake	9.0	-	-	4.0	-	5.0
Limestone	1.0	1.0	1.0	1.0	4.0	4.0
Maize	36.0	39.0	32.0	35.0	48.0	39.0
Maize Gluten Meal	7.0	8.0	6.0	-	8.0	7.0
Mineral+Vitamin Premix*	0.2	0.2	0.2	0.2	0.2	0.2
Mustard Cake	7.0	10.0	-	7.0	6.0	4.0
Rice Polish	8.0	12.0	19.0	14.0	7.0	10.0
Salt	0.3	0.3	0.3	0.3	0.3	0.3
Soybean Meal (50% CP)	12.0	8.0	13.0	5.0	8.0	7.0
Sunflower Cake	5.0	10.0	10.0	11.0	6.0	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Mineral mixture to contain per kg diet: Copper sulphate 15 mg; Ferrous sulphate 250 mg; Manganese sulphate 300 mg; Potassium iodate 1 mg; Zinc sulphate 300 mg.

*Vitamin mixture to contain per kg diet: Vitamin A 8000 IU; Vitamin B₂ 5 mg; Vitamin D₃ 1000 ICU.

3.5.4 Turkey

Turkey farming is not very common in our country, though the turkey meat is considered a good festive food. There are many varieties of turkey: Broad breasted bronze, Broad breasted large white and many non-descript. White varieties are more commonly used for commercial purpose. Indigenous and non-descriptive varieties of turkey are available in some parts of Chattisgarh, Rajasthan, Tamil Nadu,

Uttar Pradesh etc. The turkey hens are poor layers as they lay 100 eggs in first 24 weeks. The turkey egg size is about one and half time bigger than that of the chicken egg. Turkey with small body size say about 4 kg is in great demand as broilers. With optimum management, it can be achieved in about 12 to 14 weeks of age.

(i) Growth phases

For practical rearing of turkey, you can group them like chicken into three phases such as Starter (0-8 weeks), Grower (9-20 weeks) and Breeder and Layer (21 weeks onwards). Young turkeys are called poults.

(ii) Suggested nutrients

Very little work on nutrient requirements has been done in this country. Feed ingredients used in chicken ration may also be used for turkey. Compound turkey rations should be balanced with respect to energy and protein to obtain the desirable results. The demands for some of the nutrients such as energy, protein, minerals and vitamins are higher in turkey, because of faster growth. The different values for some common nutrients have been suggested for turkey in Table 3.13.

Table 3.13: Suggested Practical Levels of Common Nutrients in Feeds for Turkey

Nutrient	Starter (0-8 weeks)	Grower (9-20 weeks)	Layer (21 weeks-Above)
Energy, kcal ME/kg	2900	2800	2900
Crude Protein, %	24	15	16
Lysine, %	1.2	0.8	0.6
Methionine, %	0.6	0.4	0.4
Calcium, %	1.0	0.8	3.0
Available Phosphorus, %	0.6	0.4	0.6
Vitamin A, IU/kg	5000	4000	5000
Vitamin B ₂ , mg/kg	5	4	5
Vitamin D ₃ , ICU/kg	1000	800	1000

(iii) Feeding management

Poults give more trouble with respect to feeding. The starter period needs special feeding management as the poults have to gain more body weight in this phase. Turkey must be fed on trough (feeding vessel) and never on the ground. The trough should never be filled up full in order to avoid feed wastage.

iv) Diet composition

A few feed formulae employing common feed ingredients for turkey are listed in Table 3.14.

Table 3.14: Suggested Diet Composition for Turkey

Ingredients (kg/100 kg)	Starter (0-8 weeks)		Grower (9-20 weeks)		Layer (21 weeks & Above)	
	1	2	1	2	1	2
Bajra (Pearl Millet)	5.0	10.0	11.0	21.0	15.0	15.0
Bone Meal	1.0	1.0	1.0	1.0	1.0	1.0
Dicalcium phosphate	0.5	0.5	0.5	0.5	0.5	0.5
Fish Meal	6.0	5.0	-	3.0	5.0	-
Groundnut Cake	6.0	7.0	-	-	-	-
Limestone Powder	1.0	1.0	1.0	1.0	5.0	5.0
Maize	44.0	40.0	45.0	44.0	48.0	50.0
Maize Gluten Meal	-	8.0	-	-	4.0	-
Meat Meal	4.0	6.0	-	-	-	5.0

Mineral+Vitamin Premix*	0.2	0.2	0.2	0.2	0.2	0.2
Mustard Cake	10.0	-	8.0	-	-	3.0
Rice Polish	6.0	6.0	25.0	20.0	10.0	5.0
Salt	0.3	0.3	0.3	0.3	0.3	0.3
Soybean Meal	12.0	10.0	8.0	5.0	4.0	8.0
Sunflower Cake	4.0	5.0	-	4.0	7.0	8.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Mineral mixture to contain per kg diet: Copper sulphate 15 mg; Ferrous sulphate 200 mg; Manganese sulphate 250 mg; Potassium iodate 1 mg; Zinc sulphate 250 mg.

*Vitamin mixture to contain per kg diet: Vitamin A 8000 IU; Vitamin B₂ 4 mg; Vitamin D₃ 1000 ICU.

Check Your Progress 4

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

1) What are the growth phases of meat and egg type Japanese quail?

.....

2) Explain the feeding management of guinea fowl?

.....

3) Explain the feeding management of Ducks?

.....

4) What are the growth phases of Turkey?

.....

3.6 LET US SUM UP

Feeding of poultry is a job to be taken seriously. It needs special skill to offer balanced and complete feed to different age groups of chicken and other domestic birds. The requirement of nutrients, inclusion level and nutrient-composition of feed ingredients vary due to several factors. As an alternate to chicken, duck, guinea fowl, quail and turkey are reared on small and large farms. Each of them needs a specific complete feed having variable nutrients but balanced in every respect. Feeding of grains is not an appropriate way of feeding the birds as it would not provide the entire required essential nutrient for growth and production of bird. Similarly, finely powdered meal is not the most desirable method for feeding of bird. Thus a well-balanced ration improperly fed will not give the most satisfactory results unless proper method is followed. Different methods of feeding included such as: *Ad libitum*, controlled, restricted, phase and supplementary feeding.

3.7 GLOSSARY

Ad libitum Feeding	: Feed is always available and the bird can eat at own will.
Broiler Starter	: Broiler chicks between 0-3 weeks of age. Growth is at fastest rate (about 15 to 20 times of initial body weight) and the growth is mainly due to deposition of protein and minerals.
Broiler Finisher	: Broiler chicks between 4-6 weeks of age.
Controlled Feeding	: It is sometime attempted for a short while in first week when turkey poults do not learn or try to pick up their feed.
Dry Matter	: The dry matter (also known as dry weight) is a measurement of the mass of feed when completely dried.
Foraging	: The act of looking or searching for food.
Forced Feeding	: It may be employed in other species to prevent body dehydration if feed and water are not consumed for more than 36 hours.
Keets	: Young chicks of guinea fowl.
Phase Feeding	: In this, the production cycle is divided into three stages and phase feeding is applied for energy re-striction.
Poults	: Young chicks of turkey.
Restricted Feeding	: It is essential to delay sexual maturity and is thus essential during growing stage to retard live weight gain from becoming too fat and allowing them to economize production.
Roasters	: Large broilers between 7-8 weeks, suitable for production of different value added products.

3.8 SUGGESTED FURTHER READING

Banday, M.T. and Mondal, S.S. 2002. *Poultry Feeding and Nutrition*. Pixie Publication India (P) Ltd., Karnal (Haryana).

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3.10 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

- 1)
 - i) True
 - ii) False
 - iii) True
 - iv) False
 - v) True
- 2) Phase feeding refers to:
 - (a) changes in the laying hen's diet;
 - (b) adjust to age and state of production;
 - (c) adjust for season of the year and for temperature and climatic changes;
 - (d) account for difference in body weight and nutrient requirement of different strains of birds; and

- (e) adjust for one or more nutrients as other nutrients are changed for economic and availability reasons.
- 3) The advantages of restricted feeding include:
- (a) Delayed sexual maturity from few days to 3 or 4 weeks (b) Reduces body weight and amount of body fat (c) Cost of raising pullets is reduced (d) There is a better livability during egg production (e) Egg weight is regulated towards production of larger eggs.

Check Your Progress 2

- 1) The protein and other nutrient content of the ration can be reduced keeping the energy at same level. For broilers, a protein level of 26 % was found to be optimum in the monsoon season but the energy requirement remains the same at 3100 kcal ME/kg. For optimum growth of white leghorn, chicks required 22 % crude protein with 2700 kcal ME/kg in summer, while in winter they required higher energy level (3000 kcal ME/kg).
- 2) As the temperature increases, the feed intake declines. The rate of decline in feed consumption might be 1.5 % per degree rise in temperature from 20° to 30° C, whereas, this fall in feed intake may be 4-5 % per degree rise in temperature from 30° to 38°C.
- 3) Reduced feed intake and growth have been noticed in broilers due to heat stress. On the other hand, reduced feed intake, egg production, egg size and egg shell quality are seen in layers during heat stress.

Check Your Progress 3

- 1) The growth phases of broiler chicken are Starter (0-3 weeks) and finisher phase (4-6 weeks).
- 2) The growth phases of layer chicken are starter (0-8 weeks), grower (9-20 weeks) and layer (Above 20 weeks).

Check Your Progress 4

- 1) As per the age groups, the meat type quails are grouped in 2 phases such as Broiler starter (0-2 weeks) and Broiler finisher (3-5 weeks), whereas, the egg type quails are grouped into Starter (0-2 weeks), Grower (3-5 weeks) and Breeder and Layer (6 weeks onwards).
- 2) The guinea fowl in intensive rearing system needs balanced compounded diets similar to that of chicken. The feeding cost is usually higher in comparison with chicken due to lower growth rate and poor feed conversion. On free range system, a protein level of 16% for an adult guinea fowl with supplementary feeding of crop residue, green, household waste and insects etc. will be sufficient.
- 3) Ducks have natural tendency for foraging. Hence, they are widely reared in rice growing areas. Ducks reared in open range system eat feed comprised of fallen paddy grains, small fishes, snails, insects, earthworms, green tender leaves/grasses. After returning back, they are given supplementary feeds like paddy grains, rice polish, rice bran, wheat bran, thrashed fishes etc. Crumbles and pellets (3-8 mm size) are the best forms of feed as supplements over and above. Usually wet mash is given 4-5 times daily for ducklings.
- 4) For practical rearing of turkey, you can group them like chicken into three phases such as Starter (0-8 weeks), Grower (9-20 weeks) and Breeder and Layer (21 weeks onwards). Young turkeys are called poults.

Dear Student,

While studying the units of this block, you may have found certain portions of the text difficult to comprehend. On the other hand you might have enjoyed some of the portions. We wish to know about the strengths and weaknesses of this course and hence request you to give your suggestions, so that we may improve the course in future. Therefore, we request you to fill up and send us the following questionnaire, which pertains to this block. If you find the space provided insufficient, kindly use a separate sheet.

Questionnaire

Enrolment No.

Course Code

Block No.

1. How many hours did you need for studying the units ?

Unit no.	1	2	3	4
Number of Hours				

2. Please give your reactions to the following items based on your studying the block:

Criteria	Excellent	Very Good	Good	Poor	Give specific examples, if poor/excellent
Presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Language	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ _____
Illustrations Used (diagrams, tables, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ _____
Conceptual Clarity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ _____
Check Your Progress	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Feedback to Check Your Progress	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____

Any other comments: _____

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