

Applied Zoology

Poultry Production , Breeds ,Management , Egg And Meat And Their PRODUCTION

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POULTRY

Introduction

Poultry farming holds great potential as an industry in our country. The egg production increased to the level of about 28.5 billion during 1997-98 and currently India ranks fifth in egg production, 18th in broiler production and 22nd in poultry meat production in the world. The value of poultry products was about 9560 crores in 1996 which is almost equal to 2% of the GDP while the value of total livestock sector contribution amounts to about 9% of the total GDP. At present the annual per capita availability of eggs & poultry meat in India is about 32 eggs and 550 g, respectively. However, the aim is to produce 55 g of animal protein from poultry / person/day (30 g from eggs and 25 g from meat). This would mean that availability should be 180 eggs and 9 kg of chicken meat/year/person. In India, about 75% of total consumption of poultry meat and egg is consumed by the people of urban area and 25% of the rural area.

Poultry farming is more advantageous enterprise to the poorers as compared to other animal farming practices because :

- It requires minimum investment to start with
- There is a rapid return of profit.
- Poultry convert feed to food protein efficiently.
- It provides a continuous source of income.
- It requires a little space and provides employment opportunities.
- It provides poultry manure which is considered a best fertilizer containing 1-1.8% N, 1.4-1.8%, P₂O₅ and 0.80-0.95% K.

Related Terminology:

Poultry	: It is a collective term applied to all classes of domestic birds like fowls, ducks, turkeys, guinee fowls, pea fowls and pheasants etc.
Cock	: Mature uncastrated male of hen species.
Hen	: Mature female of hen species.
Cockrel	: A male immature of hen species.
Pullet	: A female immature of hen species.
Chicks	: Young ones of poultry.
Capon	: A castrated male of hen species.
Broilers	: Mature birds reared for meat purpose of either sex.
Fowl	: A group of birds of either sex of hen species.
Broody hen	: A hen capable of hatching eggs and rearing young chicks.

- Broodiness** : Desire in a hen to sit on the eggs.
- Layers** : Mature female birds reared for egg production.
- Broody coop** : A cage of 25 cm long, 25 cm wide and 25 cm height.
- Brooding** : Rearing of chicks after hatching.
- Stags** : Male birds below 10 months of age having tough meat.
- Crop** : It is an enlargement of gullet. It serves as a temporary storage of food where food is soften with saliva and water.
- Culling** : Removal of undesirable birds from the flock.
- Cuticle** : Outer chalky coating of egg.
- Debeaking** : Cutting of upper half of beak to prevent feather picking, cannibalism and minimize wastage of feed.
- Dressing of poultry** : Removal of feathers, blood and inedible part of the bird.
- Droppings of Excreta:** A mixture of urine and faeces of birds.
- Egg dipping** : It is done in oil or lime water for preservation of egg.
- Hatching** : The expulsion of chick from the egg after completion of incubation period is called as 'hatching'.
- Haugh unit** : It is an index of measuring the quality of the egg.
- Incubation period** : The period from setting of eggs to time of hatching at required temperature & humidity. It is 21 days in chicken and 28 days in ducks.
- Feed conversion/Feed efficiency** : It is an index of efficiency of bird in terms of kg of feed consumed per kg of weight gain in broilers (ideal is 1.8 kg) or kg of feed consumed per dozen of eggs in hen (ideal is 2.20 kg).
- Feed hoppers** : Trough hanging type feeders for birds.
- Free choice system of feeding** : Ad- lib feeding, whole grain feeding.
- Game fowl** : Sport bird like Aseel of low fertility.
- Giblet** : Includes gizzard, heart, liver and neck-edible viscera.

Grit : Shell grits are needed to crush or grind grains in gizzard. These get soluble in gastric juice and become source of calcium to body.

Hen : Mature female bird over 1 year age, in laying stage.

Incubation period : The period from setting the egg to time of hatching out of chicks.

Mash : The mixture of feed ingredients in crushed form.

Roaster : A young chicken of either sex under 8 months of age, having tender meat, soft pliable, smooth textured skin.

Breeds of Poultry:

S.No	Breed	Place of origin	Characteristics	Standard body weight
1. American class				
1	Polymouth Rock (7 varieties are- Barred, white, buff, silver pencilled, blue, partridge and Columbian)	America	Good layer, good fleshing ability, medium size, yellow skin, lay brown shelled eggs, red ear lobes and clean shanks.	Cock 4.3 kg, Hen 3.4 kg. Cockrel 3.6 kg, Pullet 2.7 kg.
2	Rhode Island Red (cross of Red Malay game x Leghorn) (Varieties are single and Rose combs)	Rhode Island in New England	Dark plumage, skin and shanks are yellow, red earlobes; lay brown to dark brown-shelled eggs.	Cock 3.8 kg, Hen 3.0 kg. Cockrel 3.4 kg, Pullet 2.5 kg.
3	New Hampshire	Rhode Island in New Hampshire of America	Lay brown shelled eggs, single comb, less rectangular body.	Cock 3.8 kg, Hen 2.7 kg. Cockrel 3.4 kg, Pullet 2.5 kg.
4	Wyandotte (Varieties are white, buff, black, Columbian, golden laced and silver pencilled)	America	Body round, shaddle feathers black, body and breast are white laced with black edge.	Cock 3.8 kg, Hen 3.0 kg. Cockrel 3.2 kg, Pullet 2.7 kg.

S.No	Breed	Place of origin	Characteristics	Standard body weight
2. Asiatic Class				
1	Brahma (Varieties are Pea comb, light dark and buff)	Brahmaputra valley in India	Massive appearance with well feathered and proportioned body, meat purpose.	Light Brahma Cock 5.4 kg, Hen 4.3 kg. Cockrel 4.5 kg, Pullet 3.6 kg. Dark Brahma Cock 4.9 kg, Hen 3.6 kg. Cockrel 4.0 kg, Pullet 3.1 kg.
2	Cochin (Varieties are Buff, Partridge, white and black)	Sanghai in china	Massive appearance, broad body, well feathered shanks, long feather	Cock 4.9 kg, Hen 3.8 kg. Cockrel 3.6 kg, Pullet 3.1 kg.
3	Langhshan (Varieties are Black and white)	Langhshan in China	Shorter & deep body. Long feathers, long shanks, single comb.	Cock 3.8 kg, Hen 3.4 kg. Cockrel 3.6 kg, Pullet 2.9 kg.
S.No	Breed	Place of origin	Characteristics	Standard body weight
3. Mediterranean Class				
1	Leghorn (Varieties are white, brown and black)	Italy	Small & compact body, small head, well set comb & wattle; beak, shanks and skin are yellow. Best egg layers	Cock 2.6 kg, Hen 2.0 kg. Cockrel 2.2 kg, Pullet 1.8 kg.
2	Minorka	Spain	Red faced, black largest and heaviest, large comb, long wattle, white skin; beak, shanks and toes are black	Cock 4.0 kg, Hen 3.4 kg. Cockrel 3.6 kg, Pullet 3.0 kg.

3	Ancona (single and rose combs)	Ancona Italy	in Black colour, thin beak, shank and toes are yellow.	Cock 2.4 kg, Hen 2.0 kg. Cockrel 2.2 kg, Pullet 1.8 kg.
S.No .	Breed	Place of origin	Characteristics	Standard body weight
4. English Class				
1	Orpington (Varieties are buff, black, white, blue)	England	Long, deep and rounded body, loosely feathered, combed, dual purpose breed.	Cock 4.5 kg, Hen 3.1 kg. Cockrel 3.8 kg, Pullet 3.1 kg.
2	Cornish (crosses by Aseel and Malay and English game breed)	England	White with yellow skin and shanks, heavy body, short legs, pea comb, deep & broad chest	Cock 3.6 kg, Hen 2.7 kg. Cockrel 3.1 kg, Pullet 2.2 kg.
3	Sussex (Varieties are light Sussex, red Sussex and speckled Sussex)	England	Plumage-deep red, long body, broad at shoulders.	Cock 3.6 kg, Hen 3.1 kg. Cockrel 3.4 kg, Pullet 2.7 kg.
4	Dorking (white, silver grey coloured)	England	Long, deep, broad and low set body, rose comb (white) and others has single comb.	Cock 4.0 kg, Hen 3.0 kg. Cockrel 3.6 kg, Pullet 2.7 kg.
5	Australorp	Australia	Single comb, black beak, shanks and toes, pinkish white sole, body of good depth, dual purpose breed.	Cock 3.8 kg, Hen 3.0 kg. Cockrel 3.4 kg, Pullet 2.5 kg.
S.No .	Breed	Place of origin	Characteristics	Standard body weight
		5.Indian Breeds		
1	Aseel (Varieties are Peela (golden red), Yakub (black & red), Nurie (white), Kagar (Black),	A.P., U.P. and Rajasthan	Pea comb, good sitter, ear lobes & wattles red short beak, scanty feathering, tail small, legs short and straight.	Cock 4-5 kg, Hen 3-4 kg. Cockrel 3.5- 4.5 kg, Pullet

	Chitta (black & white spotted) Java (black), Sabja (white or yellow with black) Teekar (brown) and Reja (light red)		It has dog-fighting quality.	2.8-3.5 kg.
2	Chittagong (Varieties are buff, white, black, dark, brown)	Eastern part of India	Strong, hardy, small pea comb, wattles are red, small red or white ear lobes, flesh broad shoulders, dual purpose breed.	Cock 3.5-4.5 kg, Hen 3-4 kg. Cockrel 3.0-3.5 kg, Pullet 2.8-3.2 kg.
3	Kadaknath or Kalamasi	Jhabua and Dhar districts of western M.P.	Skin, beak, shanks and toes are slaty colour, comb wattles and tongue are purple,	Cock 1.5 kg, Hen 1.0 kg. Cockrel 1.2 kg, Pullet 0.8 kg.
4	Bursa	Gujarat and Maharastra	Medium sized, light feathered, alert, varied colour, layer type breed	Cock 1.8-2.0 kg, Hen 1.2-1.5kg. Cockrel 1.4 kg, Pullet 1.0kg.

Poultry management:

Poultry management usually refers to the husbandry practices that help to maximize the efficiency of production. Sound management practices are very essential to optimize production. The success or profitability of laying flock depends on the quality of the pullets housed at 17-20 weeks of age. Production of profitable pullets depends on well-planned and scientific rearing of chicks. Chickhood is the most critical state and any problem early in its life would affect the growth of chicks and ultimately affect the production of eggs and meat.

Hatchery Management

Efficient production of baby chicks is very important for development of poultry enterprise. In early days eggs were hatched by placing them under broody hen. This method of hatching is unsatisfactory for large scale production of chicks because under this system at one time one bird can hatched only 10 to 12 eggs. Egg incubators, which provide similar environment as that the broody hen, can hatch a large number of fertile eggs at one time.

Methods of hatching the eggs

- (1) Natural method: Eggs are incubated with the help of broody hens.
- (2) Artificial method: Eggs are incubated in egg incubator.

(i) Natural Incubation

In village conditions deshi hens are used to hatch the eggs. These hens need little food and less attention but under prevailing conditions, the results are generally comparatively poor.

(ii) Artificial Incubation:

There are two types of incubators available in the market:

1. Electrical incubators (capacity 25 to 40, 000 eggs)
2. Kerosene oil incubators (capacity 50 to 200 eggs)

Following conditions must be maintained accurately and efficiently for proper hatching of the eggs for chick production.

(A) Temperature and humidity: The temperature requirement varies from 37.2 to 37.7°C depending upon the construction of the incubators. For the chicken eggs 60 per cent relative humidity during the first 18 days and 70 per cent thereafter, is recommended for both kerosene oil and electrical incubators.

(B) Turning of eggs: The eggs are held in batches in trays, which can be tilted to one side or the other to substitute for the earlier method of hand turning.

Process: Run the incubator at least for 24 hours and make sure of regulating the temperature before setting the eggs (for electrically operated incubator 99.75°F and 103.0°F for Kerosene oil incubator).

- In Kerosene oil incubator, the wick should be clean. Flame should be non-smoky. Avoid smoke as far as possible. Use purest form of Kerosene oil.
- Ventilation is necessary for removing the foul air given out by the chicks and for the supply of fresh air prevent direct heat and chilling.
- Control humidity 54 per cent or 84 per cent relative humidity is desirable in the incubator. To achieve this moisture may be provided:
- Sets egg in egg trays with broad ends on the top.
- Do not disturb eggs for first 36 hours.
- From 36 hours to 18th days the eggs should be regularly turned twice or thrice or even more at equal intervals every day.
- Candling of eggs: This is generally done on the 7th and 18th day. (This consists of passing a beam of light through the when it is placed over a slit or diaphragm which excludes surrounding rays so that the state of the egg can be seen with ease)

Management of Young Chicks:

Most of the chicks received from hatcheries are generally screened and culled, thus viable and healthy chicks alone are delivered to the brooder house

Chick Sexing:

1. Vent method: This method is very popular and was originally developed in Japan. This method is based upon the presence of rudimentary sexual organs present in male chicks. In case of males there are 3 bean shaped emiscences and in female the center protuberance is missing.

2. Machine method: This machine has a tubular structure with magnifying lens and an eye lens to see through. When one end of the machine is inserted into the cloaca, an enlarged view of sex organs is illuminated. As a result, it becomes easy to differentiate the sex organs.

3. Auto Sexing method: Certain genetic characters such as plumage colour or growth of organs linked with sex chromosomes are taken into account to help in sexing process. If such a character is identified, sexing becomes very easy and accurate.

Brooding management of chicks:

Care and management of young chicks up to the age of 4-6 weeks is known as brooding. There are two methods of brooding.

1. Floor brooding:

Before chicks arrive in brooder, following precautions should be taken:

- The brooder house should be smoothly spread with about 8 cm of fresh litter materials.
- The common litter materials used are groundnut shell, wood shavings, sawdust, rice hull, chopped straw and bagasse, etc.
- The brooder house should be prepared well and kept ready for placement of chicks at least a week before their arrival.
- Brooder house and the equipment must be thoroughly cleaned and disinfected to make the house free from disease producing organisms.

2. Battery brooder:

- The battery brooder should be kept clean and thoroughly checked to maintain the desired temperature.
- The brooder should be switched on at least 24 hours before the placement of chicks.
- If the heat source for brooding is from Kerosene, due care should be taken to avoid fire hazard.
- The floor space of 100 Cm² per chick is required in the brooder.
- A 15 watt bulb, well protected by wire guard should be fixed in each compartment to allow feeding at all hours of the day.

Brooder House:

- Brooder house should be damp free, rain proof and protected against predators.

- Brooding pens should have window with wire mesh for adequate ventilation.
- Dusty environment should be avoided.
- The corners of brooder house should be rounded off with cardboard or metal chick-guard to prevent the chicks from pilling up in the corners.
- The house should be properly scrubbed and cleaned at least a week before the chicks arrive.

Litter material used:

- The common litter material used are saw dust and paddy husk.
- Mouldy material should not be used.
- The litter should be stirred at frequent intervals to prevent caking.
- Wet litters if any should be removed immediately and replaced by dry new litter, this prevents ammonical odour.

Temperature:

Making provision for optimum brooding temperature gives comfort and proper growth for chicks. Following schedule for brooder temperature is recommended :

Age in weeks	Brooder temperature schedule °F
0-1	95
1-2	90
2-3	85
3-4	80
4-5	75

Light:

1. All -night light with uniform distribution, is essential up to 8 weeks of age.
2. For broiler, night light is essential for first two days.
3. The effect of light on growth rate is mainly due to the type of chick activity which has a bearing on their food intake induced by the period of lighting.

Vaccination: Vaccination against New Castle (Ranikhet) and Marek's disease are usually done at day old chicks.

Disease Control: Sound management practices and practical and judicious use of medicine are essential to tackle disease hazard.

Ventilation: Fresh air is important for good health.

Management of Growing Pullet (Growers):

The period after brooding sexual maturity is referred to as growing period. Growing pullets should be maintained in good health and adequately immunized against diseases, which can affect adult stock, if they are to show efficient conversion of food to eggs. Management of pullets during growing period is critical, but often neglected by the poultry keepers.

Culling of pullets:

- Underdeveloped and diseased pullets are culled immediately.
- Pullets having undesirable characteristics are culled as early as possible during growing period.
- Males removed from the flock due to sexing error.

Lighting Management:

- After 8 weeks and up to 20 weeks of age, only natural light is sufficient.
- Night light should be avoided during the growing period to counteract the undesirable effects of light, particularly in the age of sexual maturity.

Housing Management:

- Floor space requirement for a growers are 950 to 2,350 sq. cm.
- Feeder and water space requirement for a grower pullets are 7.5 to 12.8 cm and 2.0 to 2.5 cm, respectively.

Water Management:

- Water consumption is influenced by temperature, humidity, age, dietary constituents, activity and air movement.
- Water consumption increases rapidly when temperature exceeds 85°F.

Sanitary Management:

- Deworming is very essential at least once bimonthly to keep the birds free from parasitic diseases.
- Deworming should be done either in the evening or early in the morning.
- If necessary, top 0.6 cm of litter is scraped and removed to prevent infection.

Placing of laying nest:

- Net-boxes should be placed at least one month before the start of laying in order to encourage the bird to lay eggs in boxes.
- Multi-tiered egg boxes can be used for chicken.

Management of Layers:

The flock should be transferred from grower to layer house at 18 to 20 week of age. In breeding flocks male should be placed in the laying quarters 1 to 2 days prior to housing the females, if they have grown separately to housing time. For better egg production, proper management of feeding, housing, litter, lighting and disease control must be provided. In spite of providing infrastructure of high yielding hybrid layer, well balanced feed and health cover, the egg production performance varies widely from high to low production. The salient factor that makes all the differences is management. A progressive poultry farmer by adopting scientific management maximizes his farm income utilizing fully available limited resources. Both the cost of the feed and egg price being beyond his control, the economics of egg production depends on managerial practices.

Lighting management: It is well known that light stimulates ovulation by acting on the hypothalamus through the optic nerve. When the bird start laying eggs at 20 weeks of age, the

total photo period should be provided for 16 hours per day. Nearly 17 hours photo period is required for birds from 45 weeks of age.

Intensity of light is not very important in layer houses. 40 watts bulb with reflector, having 30 cm diameter, will be sufficient to give light to a surface of 100 sq. ft. Electric bulbs should be fixed for every 10' throughout the surface of the layer houses and a height of 7' from the deep litter. This will provide enough light to stimulate the process of reproduction.

Management of Broilers:

A broiler is a young chicken of either sex below 9 weeks of age weighting 1.5 to 2.0 kg body weight, with a tender, soft, pliable, smooth textured meat and flexible breast. Healthy chicken procured from brooder house of 2 weeks age should be transported to broiler house and following managemental practices should be followed: -

Floor space requirement: Broiler will require from 0.8 to 1.0 square feet of floor space per bird.

Temperature: To maintain the temperature of broiler house is very important. On the first week 95°F is quite comfortable and it may be reduced by 50°F weekly until 70°F is reduced.

Lighting: Growing chicks in semi-darkness by using red bulbs keeps the chick quite, prevents cannibalism and may have a slight effort on feed efficiency. Most broiler growers provide light in the brooder house 24 hours a day throughout the entire growing period. One 60 watt bulb for each 200 square feet floor space sufficient.

Ventilation: The main functions of ventilation are to maintain oxygen, keep carbon dioxide at low level, remove dust or moisture and ammonia from the house and maintain required temperature. If necessary exhaust fan may be used.

Debeaking: In addition to preventing cannibalism, debeaking usually mash feed wastage. Electric debeakers may be used and chicks are debeaked when only one day old.

Litter management:

Rice husk, saw dust, wood saving etc may be used for litter to the depth of 5 to 7 cm. Litter material should be clean, dry, new soft, free from dust and aflatoxins.

Housing and Equipment Requirements:

Poultry houses should be designed in such a way that the bird should be protected from extremes of weather conditions, parasites, predators and thieves, to avoid the development and spread of infections and contagious diseases.

1. **Cage house:** Birds are kept in cages.
2. **Loose housing system (Deep litter system):** In deep litter systems the hens are kept in a building in which they are free to roam about.

Advantages to deep litter system over the cage system are given below:

- Less investment per laying bird.
- Less difficulty in flying control.
- Offers the advantage of self control to birds during extreme hot and cold climates.
- Less labour involved in collection and handling of eggs.
- Poultry litter is used as a fertilizer.

Poultry Farm Records:

Keeping records are a key operation in poultry farms. Without records one cannot know how the poultry enterprise is going on. List of various records registers to be maintained in poultry farms are given below:

1. Chick register
2. Poultry account register
3. Mortality register
4. Feed register
5. Hatchery register
6. Egg collection and disposal register
7. Inventory record
8. Pen record for brooder chicks
9. Pen record for layer chicks
10. Attendance and wages records
11. Monthly receipts and expenditure
12. Yearly assessment book

Disposal of poultry manures:

Poultry droppings contain faeces mixed with urine and hence richer in manorial ingredients. This contains nearly 3%N, 2% Potash and 2% Phosphorous which has 10 times more ingredients than the cow dung manure. To prevent unpleasant odour ammonia, superphosphate should be added @ 1.4 kg per ton of manure produced by 100 hens.

Feeds and Feeding:

Poultry production mostly depends on the types, source and quality of feed, which accounts for the major share of the cost of poultry raising. Feed represents about 70% of the total cost of egg production and 55% of the cost of broiler production. Therefore, efficiency of feeding is one of the key factors for successful poultry production. It is in the interest of every poultry man to be able to get as much chicken meat or as many eggs for every rupee that he spends on the feed as possible

Peculiarities associated with Poultry Nutrition:

- Birds have simple stomach.
- Birds have no teeth hence they can not chew their food but feed is grinded with the help of gizzard (an organ of their digestive system)
- Birds are very sensitive to environment.
- Birds, being small in size, they are usually fed in groups.
- Feed must be exact and must have all essential nutrients in balanced form.
- Feed must be appetising, easily digestive, properly grinded and free from aflatoxins.

- Fresh and clean water must be available at all times.
- Birds can utilize maximum 7% crude fibre in their feed.
- Birds have much higher rate of metabolism than the other farm animals; therefore, their feed should be more precise and specific for each category in order to avoid any nutritional problem

Type of ration for poultry:

Broiler Starter Ration: This feed is provided to broiler chicks from 1 day old to 2 weeks of age. It should contain minimum 2,900 K cal/Kg M.E., 22% crude protein, 1% Ca, 0.5% P and sufficient amount of other minerals and vitamins. Crude fibre and acid insoluble ash in ration should be maximum 6% and 3%, respectively.

Broiler Finisher Rations: This ration is provided to the broiler chicks from 3rd week to the marketable age. It should contain minimum 3,000 K cal/kg M.E., 19% crude protein, 1% Ca and 0.5% P, maximum 6% crude fibre, 3% acid insoluble ash and sufficient amount of other minerals and vitamins.

Chick Starter Ration: This ration is offered to the layer chicks from 1 day old to 8 weeks of age. The ration should contain minimum 2,700 K cal/Kg M.E., 22% crude protein, 1% Ca and 0.5% P maximum 7% crude fibre, 4% acid insoluble ash and required amount of other minerals and vitamins.

Chick Grower Ration: This feed is provided to the layer chicks from 9th week to 20 weeks of age. It should contain minimum 2700 K cal/Kg M.E., 16% crude protein, 1% Ca and 0.5% P maximum 8% crude fibre, 4% acid insoluble ash and sufficient amount of other minerals and vitamins.

Layer Ration: This type of ration is offered to the layers (from 21st week to 75 weeks age). It should contain minimum 2,700 K Cal/Kg M.E. crude fibre, 2.7 % Ca and 0.5% P, maximum 8% crude fibre, 4% acid insoluble ash and sufficient amount of minerals and vitamins.

Nutrient requirements:

Fortunately, the nutrient requirements of chickens are known more accurately than for other farm livestock. Several standards are available for feeding of poultry birds and some of them are listed below:

ISI specification of diet for chicken

<i>Ingredients</i>	Broiler starter (0-6 weeks)	Broiler finisher (6-9weeks)	Chick (0-8 weeks)	Grower (8-20 weeks)	Layer (20-80 weeks)	Breeder (20-80 weeks)
Metabolizable energy (K cal./kg), Min	2900	3000	2700	2700	2700	2800
Crude protein (%) Min	22	17	22	16	18	18
<i>Crude fibre(%) Max</i>	6	6	7	8	8	8
Acid insoluble ash (%)	3	3	4	4	4	4

Lysine (%) Max.	0.9	0.9	1	0.7	0.5	0.5
Total sulphur amino Acid (%) Min.	0.75	0.75	0.75	0.5	0.5	0.5
Methionine (%) Min.	0.35	0.35	0.35	0.25	0.25	0.25
Vitamin-A (I.U./kg)	6000	6000	4000	4000	8000	8000
Vitamin-D (I.U./kg)	600	600	600	600	1200	1200
Thiamine (mg/kg)	2	2	6	6	6	6
Riboflavin (mg/kg)	5	5	5	5	5	8
Pathonic acid (mg/kg)	12	12	10	10	15	15
Niacin (mg/kg)	40	40	30	20	20	20
Biotin (mg/kg)	0.1	0.1	0.1	0.1	0.15	0.15
Vitamin-B ₁₂ (mg/kg)	8	8	15	15	15	30
Vitamin-E (mg/kg)	20	20	10	10	10	20
Choline (mg/kg)	1400	1400	1300	-	-	1300
Linoleic acid (%) Max.	1	1	1	1	1	1
Common salt (%) Max.	0.6	0.6	0.6	0.6	0.6	0.6
Calcium (%) Min.	1	1	1	1	2.75	2.75
Phosphorous (%) Min.	0.5	0.5	0.5	0.5	0.5	0.5
Manganese (mg/kg)	1	1	1	1	1	1
Iron (mg/kg)	40	40	20	20	20	20
Copper (mg/kg)	4	4	2	2	2	2
Zinc (mg/kg)	50	50	-	-	-	-
Moisture (%) Max.	10	10	10	10	10	10

CARI specification of diet for chicken

<i>Ingredients</i>	Broilder starter (0-6 weeks)	Broiler finisher (6-9weeks)	Chick (0-8 weeks)	Grower (8-20 weeks)	Layer (20-80 weeks)	Breeder (20-80 weeks)
Metabolizable energy	2900	2900	2700	2600	2700	2700

(K.Cal/kg)						
Protein (%)	23	20	20	10	18	18
Minerals						
Calcium (%)	1.0	1.0	1.0	0.8	3.0	3.0
Phosphorous (%)	0.45	0.45	0.45	0.45	0.45	0.45
Sodium (%)	0.2	0.2	0.2	0.2	0.2	0.2
Potassium (%)	0.4	0.4	0.4	0.4	0.4	0.4
Manganese (mg/kg)	70	70	70	70	50	50
Iron (mg/kg)	80	80	80	50	50	50
Copper (mg/kg)	8	8	8	8	8	8
Zinc (mg/kg)	60	60	60	60	75	75
Iodine (mg/kg)	0.6	0.6	0.6	0.6	0.5	0.5
Vitamins/Kg						
Vitamin-A (I.U.)	4000	4000	4000	4000	6000	8000
Vitamin-D (I.U.)	600	600	600	600	1000	1000
Vitamin-E (I.U.)	20	20	20	10	10	20
Vitamin-K (mg/kg)	2	2	2	2	2	2
Thiamine (mg)	4	4	4	2	2	2
Riboflavin (mg)	5	5	5	5	5	8
Pantothenic acid (mg)	15	15	15	15	15	15
Niacin (mg)	40	40	40	20	20	20
Pyridoxine (mg)	6	6	6	6	6	6
Biotin (mg)	0.1	0.1	0.1	0.1	0.1	0.15
Folic acid (mg)	1.0	1.0	1.0	1.0	0.5	0.8
Vitamin-B ₁₂ (mg)	0.009	0.009	0.009	0.05	0.003	0.005
Choline (mg)	1400	1400	1300	-	-	-
Linoleic acid (%)	1.0	1.0	1.0	1.0	1.0	1.0

Poultry feed ingredients:

Poultry feed for different purposes is prepared by mixing following ingredients in required amount.

1. **Energy source:** Crushed cereal grains like Bajra, Maize, Barley, Sorghum, Oat, and Wheat. Cereal by-products like Rice polish, Wheat bran, Pulse chuni, Gram husk etc.
2. **Fat Source:** Like lard, tallow, vegetable oil etc.
3. **Protein source:** Vegetable source like G.N. cake, sesame meal, soyabean meal, cottonseed meal, coconut meal, mustard cake, linseed meal, yeast etc. From animal source like blood meal, fish meal, meat meal, poultry by-products, milk by-products etc.
4. **Vitamin Supplement:** Like rovi-be, vitablend, rovimix, poultry vitamins etc.
5. **Mineral supplement:** Lime stone, bone meal, salt, mindif, Ferrous sulphate, shell grit etc.
6. **Non-nutritive feed-additive:** Substances which can not provide any nutrient but these promote the growth and egg production in poultry by increasing the utilization of feed nutrients, protect some of the diseases and enhance the storage quality of feeds. These are Antibiotics, Arsenicals, Drugs, Hormones, Antioxidants and Antifungals etc.

Health and Diseases:

Control measures for prevention of diseases:

- Separation of healthy birds from diseased ones.
- *Housing birds of different age groups, sex and species separately in different houses.*
- Start with day old chicks separately from old birds.
- Keep litter and houses free from dampness.
- Provide proper ventilation for healthy environment.
- Adequate exposure of floor to sunlight.
- Adequate sanitation and disinfection.
- Enough floor space according to age, size, breed, number and purpose.
- Adequate drainage of water.
- Proper disposal of dead birds by burning.
- Never make reuse of old litter.
- Vaccination of birds at proper time and age regularly.
- Keep feed from aflatoxins.

Vaccination of birds:

With the continuous research undertaken in the field of animal science, some useful vaccines have been evolved at various research stations established in different parts of the country. As these vaccines conferred protection in the poultry birds against certain contagious diseases, the

incidence of such diseases was reduced and the poultry keepers were encouraged to grow more poultry. Birds should be vaccinated by adopting following schedule: -

Schedule of vaccination against prevalent diseases in birds

Chicks' age	Disease	Name of vaccine	Storage	Immunity	Route	Dose
1 day	Infectious Bronchitis	Egg-adapted IB Vaccine	6 months at refrigeration for temperature	Not worked out	Intra-nasal	Two drops
1 day	Marek's Disease	Cell free or cell associated turkey herpes virus	As indicated by manufacturer	Now worked out	Intra-muscular or intraperitoneal	As manufacturer's instruction
4-5 days	Ranikhet Disease (New-castle Disease (RD)	Ranikhet Disease Vaccine Strain	3 months in a refrigerator and 10 days at room temperature	15 weeks	Intro-nasal or intra-ocular	Two drops
4-5 days	Fowl pox	Pigeon pox	2 months in refrigerator	6-8 weeks	Feather follicles	Swab
6-8 weeks	Fowl pox	Chick embryo-adapted fowl pox	2 months in refrigerator	Lifelong	Wing-web	Two pricks
9-12 weeks	Ranikhet Disease (New-castle Disease	Ranikhet Disease Vaccien R ₂ B (Mukteswar)	3 months in refrigerator, 7 days in summer, 10 days in other season.	Lifelong	Intra-muscular	0.5 ml

Common Diseases of Poultry:

S.No.	Name of disease	Causal organism	Symptoms	Prevention & Control
1. Viral Disease				
1	Ranikhet (New cattle disease)	Virus	Difficult respiration with pronounced gasping, coughing and ratting of windpipes, paralysis, tremour of head and body, head between the legs or straight back between the shoulders.	Vaccinate the birds against RD and repeat vaccination. No effective treatment is available.
2	Fowl Pox	Virus	<u>Dry Pox:</u> Scabs and pimples on the combs,	Vaccination during growing period and

			face and wattles. <u>Wet Pox</u> : Affects the musus membranes of mouth and oesophagms.	repeated at laying stage also. Apply glycerine on the parches. No effective treatment.
3	Marek's disease (M.D.)	Virus	Paralysis of legs or wings, difficult breathing, whistling and movement in circle, blindness and skin tumours	Immunization of birds by vaccine (Herpes Turkey virus, HTV)
4	Infection Bronchitis	Virus	Moist coughing and wheezing at night, sharp drop in egg production and shoft shelled eggs.	No deficient treatment. Nursing the birds by good care.
2. Bacterial Diseases				
1	Pullorum	<i>Salmonella pullorum</i>	Chicks huddle near the heat source as they are chilled, wings sagging, head hanging, feather ragged, difficult breathing, diarrhoea, vent becomes pasted with whitish and greenish material	Good hygienic condition. Fumigation of incubator. Auromycin powder 8-16g/litre water or sulphamezathine (16%) @ 30 ml/4 litre water for 100 birds for 4 days.
2	Chronic Respiratory Disease (CRD)	<i>Mycoplasma gallisepticum</i>	Sniffing, rattling, sneezing, nasal discharge, swelling on eyes.	Very high standard of hygienic condition. Furazalidone or streptomycin @ 100-400 g/ton feed or with water.
3	Infectious coryza (Roup)	<i>Haemophilers gallinarum</i>	Discharge from eyes & nose, sneezing, coughing, gasping difficult breathing, head side often swollen, cheesy materials fills in the eyes.	Isolation & sanitation 500 g sulphathizole/qu. Poultry mash, or streptomycin @ 0.1 or 0.2 g intra muscular injection.
4	Omphalitis (Novel infection)	<i>Coliform, Staphylococcus pseudomonas</i>	Weakness, hundle near brooder, watery diarrhoea, abdomen soft, flabby and enlarged, sudden death.	Disinfect the eggs before incubation, antibiotics and nitrofurans.
5	Avian Tuberculosis	<i>Mycobacterium tuberculosis</i>	Gradual loss of weight, weakness, dullness, diarrhoea, lameness, anemia, sleepiness.	No effective treatment.
3. Fungal Diseases				
1	Aspergillosis (Brooder Pneumonia)	<i>Aspergillus fumigatus</i>	Difficult breathing or through the open beak, ratting, loss of appetite, weakness, death in 48 hours.	Cleanliness & fumigation of brooder house. Hamycin 10 ml/litre of water for 10 to 15 days.
2	Aflatoxicosis	Toxins B ₁ , B ₂ , G ₁ , G ₂ ,	Dullness, discharge, loss of appetite,	Fungal free feed to the birds. Antafla @ 400 g/ton

		<i>Aspergillosis flavus</i>	feathers ruffled anemia, convulsion and death.	feed at 0.5-1 ppm pentachlorophenol/litre water.
4. Protozoal Diseases				
1	Coccidiosis	Coccidia	Blood droppings, diarrhoea, dehydration, reduced feed intake and egg production.	Administration of drugs like Amproleum, nicarbazin, Sulphadizine etc.
2	Avian Malaria	<i>Plasmosium gallinaceum</i>	Rise in body temperature, greenish diarrhoea, anaemia, paralysis.	Good sanitation & hygiene, sulphodiazine @ 100 mg/kg body weight or chloroquin @ 5 mg/kg body weight.

Egg and Egg Products

Egg is one of the most nutritious foods for human beings. Generally, infertile egg is consumed. It contains all the nutrients (except Carbohydrate) required for a body. Except shell, whole egg is consumed in various ways.

Composition of Egg:-

Egg contains all the nutrient in proper amount which are needed every day. But it is deficient in carbohydrate content.

Constituents (%)	Whole Egg	Albumen	Yolk	Shell
1. Water	65.0	88.5	48.0	1.0
2. Protein	11.8	10.4	17.5	4.0
3. Carbohydrates	0.7	0.5	0.2	-
4. Fat	11.0	-	32.5	-
5. Ash	11.0	0.5	1.1	95.0
6. Others	0.2	-	0.8	-

Nutritive value of Egg:-

Egg is not only nutritious but also easily digestible giving high protein efficiency ratio of 3.8 as compared to meat 2.6 and cereals 1.3, along with 96% digestibility. In this way, an average egg is 1.5 times better to meat and 3 times to cereals. An average egg of 58 g can be obtained at the cost of 2.00 only that provides 6 kg protein, means 1 g protein at the cost of 33 paise. No other food can provide highly digestible protein at such a cheap rate.

Nutritive value of a food depends on the quality and quantity of the nutrients present in it. Nature has provided two unique foods like egg and milk which are called nearly perfect food. Brief description of the nutrients of an egg as follows:-

Proteins:- An egg of medium size (58 gm) possesses approximately 6.5 gm protein out of which 3.5 gm is found in albumen and rest 3.0 gm is available in yolk. Egg protein contains all the essential amino acids which are essential for a person. As such the egg protein is of high quality and it is taken as a standard for comparing the utility of proteins from other sources. Egg protein is highly digestible and it has all the essential amino acids in such proportions which are very important for growth, production and breeding purposes.

Fats: - Fat is only present in yolk. One hen's egg contains approximately 6 gm fat in which unsaturated fatty acids are to the tune of 4 gm. It is a well established fact that unsaturated fatty acids are oxidized quickly and provide energy of the body. Egg fat is rich in lecithin which strengthens nervous system of the body.

Carbohydrates: - Egg contains very few amount of carbohydrates and one egg contains only 0.78 gm. Therefore, egg is useful to the diabetic patients.

Vitamin: - Egg possesses almost all the vitamins which are deposited in the yolk. Vitamin A,D, Riboflavin, and Choline are present in sufficient amount. The concentration of vitamin D in egg depends on the fact that how much time hen spend time in sun light. It is assumed that an egg fulfills about 15% requirement of vitamins of a person.

Mineral-matters: - Mineral-matters control the physiological function of the body. Amongst them calcium, phosphorous and iron are very essential for the body and later two are sufficiently present in the egg. Egg contains 187 mg and 2.4 mg phosphorous and iron, respectively of which major portion exits in the yolk.

Calorific value:-With regards to energy generation egg is regarded medium food product. It has low calorific value as compared to other superior food products due to low carbohydrates content. As per Doctor's advise an adult must take two eggs per day. Presently, the cost of two eggs is equal to the cost of 250 ml cow milk.

In brief, following points may also be considered useful regarding nutritive value and use of eggs: -

- Egg is a good source of protein, iron, vitamin A, D and B₂.
- Egg is pleasing to palate, nutritive and easily digestible food animal origin.
- Egg cannot be adulterated and it is available throughout the year.
- The protein and fat of egg are easily digestible.
- Various food products are prepared from the egg.
- It is used in bakery also.
- Egg has capacity to absorb oxygen, therefore, product prepared with the addition of egg content becomes spongy.
- Egg has very high digestibility and the body utilizes 97% portion of egg

Egg Products

Cooked or baked	Frozen or cooled	Dried
Boiled egg Omelett Scrambled egg Fried egg Egg biriyani Egg pudding Egg cakes Egg pastries Egg biscuits Egg curry Egg pickles Egg custard Egg korma Poached egg Egg rolls Egg and Potato patty	Frozen egg Apple egg drink Egg malted milk Cocoa egg nog Frozen french toast Frozen western egg product Frozen egg pulp	Egg powder Whole egg powder Albumen/yolk powder Foods fortified with egg powder Albumen flakes Sponge cake Angel cake salad dressing

1. Cooked or Baked egg products: -

Most of the egg products are prepared by baking either in oven or in tandoor. Cooking of eggs is essential which has following plus points: -

- Cooked egg is quickly digested as compared to raw egg. Thus, cooking enhances the digestibility of eggs.
- Cooking develops desirable flavour and taste of egg.
- I. Harmful organisms present in egg are destroyed by cooking.
- Biotin in egg is present in the form of 'Avidin-biotin complex' which on cooking or heating the avidin gets free and the biotin is assimilated easily by the body.

Boiled Egg:

When egg is heated its proteins are coagulated as it contains heat labile protein. Firstly eggs are washed with clean water and checked that their shell is not be cracked. Now eggs are kept in a pan which is filled with water. The water level should be above the level of eggs. Then pan is covered with a lid and the heat is switched on. It is kept on boiling for 3 minutes. After that the egg are taken out cooled out & the shell is removed. It is usually divided into 4 pieces &

garnished with salt, pepper and coriander leaves before consuming. Some vitamins and 0.1 gm protein of egg are lost on boiling but half-boiled egg does not lose any nutrient.

Omelett: -

Pour the egg content into a tumbler by breaking the shell of egg. Now egg content is beaten well with the help of spoon to make it homogeneous and get all the above things (except fat) mixed well. A shallow pan is kept on slow fire, pour half the fat and spread at whole surface of the pan. After that the mixture is spread in the pan with the help of ladle and the rest of the fat is poured around it. When it becomes light yellow or creamy, fold it and remove from the pan, it is called omelet. Some vitamins and about 0.2 gm protein are lost during omelet making.

Scrambled egg: -

This is similar to omelet but differs in the way that in addition to things used for omelet making, 15-20 ml milk is also added while making scrambled egg. It is prepared in the same way as omelet but it is more tasty and nutritious than the omelet.

Fried eggs: -

It is prepared in the same way as omelet with similar ingredients. Only difference is that during preparation it is agitated continuously with the help of ladle so that the content is shredded into small pieces.

Egg Biryani: -

Cooking of rice added with desired amount of saffron and spices along with fried eggs is called 'Egg Biryani'.

Egg Pudding: -

Take 75 gm deshi ghee in a pan (karahi) and heat over fire. Now, all the things (except deshi ghee) are mixed together in a separate pan, transfer it carefully into the karahi, add rest (25 gm) of the deshi ghee and agitate the mixture continuously with the help of ladle. When it turns brown, take off karahi from the fire and spread the mixture homogeneously in a large and shallow pan. After cooling the content, cut it in equal sized square pieces with knife and cream is spread over it. Now egg pudding is ready for consumption. Egg pudding is both tasty and nutritious.

Egg Cake: -

Content of two eggs & sugar is beaten gently and hot milk is added to it. It is mixed well and kept in oven for setting at medium temperature. It takes about 40 minutes in baking. Mixture is filled in the same type of mould as the shape of the cake is desired.

Egg Patties: -

Add salt to flour and knead till it becomes soft (like the flour which is prepared for chapatti making). Now it is again kneaded with a little cold water which makes it smooth. The content is spread homogeneously on broad board and is divided into two parts. After that desired amount of tomato sauce is spread over it, both pieces are folded separately in length (making the design like samosa) and sealed. These pieces are baked for 25 to 30 minutes after applying the milk at one end. Now, a patty is consumed along with pickle or sauce.

Egg Biscuits: -

Small amount of egg content is added for the preparation of biscuit but it makes the product spongy, khasta and nutritious. Rub the mixture of flour, salt, backing powder and margarine. Add powdered sugar, beaten egg content to it and knead well after rubbing with both the hands. Now the content is filled in moulds and keep them one by one the surface of oven after applying fat. These are backed on medium temperature for 10 to 15 minutes then removed from the oven, cooled and packed.

Egg curry: -

First of all, pour mustard oil in a pan & switch on the heat. Make a paste of all things except eggs when the oil becomes hot put the paste into the pan and fry well. Agitate it with a ladle till it becomes brown. Then add required amount of water and boiled and peeled eggs. Switch off the heat after boiling the mixture for 5 minutes. The egg curry is ready. It may be complemented with chapattis or rice just like other vegetable. The quantity of things required depends on the quantity of egg curry is to be prepared. Generally, the ratio is 2 eggs with curry per person.

Pickle of eggs: -

Eggs are boiled to become hard, peeled and kept layer wise in a wide mouthed jar. Bay leaves are inserted between two layers and the vinegar is taken in a pan & black, red pepper, and ginger pieces, are added to it. It is boiled, cooled and powdered on the eggs and the jar is covered tightly with its lid. When colour of eggs changes, then pickle is ready for consumption.

Egg custard: --

The content of egg is beaten and salt and sugar are added. Now the mixture is poured into milk & agitate slowly with ladle continuously so that the content of pan becomes viscous. Then it is filled in cups after the addition of vanilla flavour and the cups are kept in hot water. When this mixture settles well, the custard is ready to serve .

Egg Korma: -

onion is chopped into small pieces and egg content is beated well. Then egg yolk, milk and salt are added to it and this mixture is again beated for 10 minutes. Mixture is heated on fire in a shallow pan, removed and then it is cut down in the shape of cubes.

After that ingredients in group B are grinded & made into a paste. In a separate pan cashewnuts are fried in hot ghee and small pieces of onion along with paste of spices + salt are added. This mixture is allowed for cooking on slow fire and agitated some times with the help of ladle. When it is cooked well, ghee start flowing its top surface, then add 150 ml, hot water and boil again. Now cubes are put in and cooked till the korma becomes viscous. This is egg korma which is usually complemented with Paratha or rice.

Poached egg: -

2'' deep water is filled in a pot & boiled. The egg content is added and cooked for 2 to 3 minutes. Now pick up the egg content, wrapped with cloth and water is squeezed by pressing between hands. If desired it can be divided into pieces and the product is called poached egg.

Egg rolls: -

This product is very popular in America particularly as a breakfast meal. About 2 to 7 days old eggs are used for its preparation because after cooking the albumen of fresh egg becomes pulpy. A tube is prepared by polypropalire and one end of it is sealed. Now fill the content of 4 eggs, close the other end by folding it, cooked in hot water (92⁰C) for twenty minutes and can be stored at 7⁰ C temperature upto 13 weeks also.

2. Frozen or Cooled Egg Products: -

Frozen eggs:-

The ingredients needed are mixed well to the properly beaten egg content and is kept at 15⁰ C temperature for freezing. After freezing it is eaten by spoon similar to ice-cream. This product is popular in foreign countries and it is generally not favoured in India.

Apple egg drink: -

It is developed in America for those persons who have no time to have breakfast which fulfils requirement of all the nutrients.

The ingredients needed are filled in a jar and mixed thoroughly in a mixer. When all the ingredients are mixed well, the content is poured in a tumbler and is ready to drink. This product is very tasty and nutritious also.

Cocoa Egg Nog: -

Egg white is beaten sufficiently and sugar, cocoa, salt and milk are added at the same time and the mixture is beaten continuously. Now it is mixed well with cold water and is ready for consumption.

3.Egg Powder: -

Kinds of Egg powder: - Egg powder may be of 3 kinds: -

- (i) **Whole egg powder:-** This is prepared by drying the mixture of yolk and albumen of the egg.
- (ii) **Yolk powder:-** This is prepared by drying only yolk portion of the egg.
- (iii) **Albumen or white powder: -** This is prepared by drying only albumen portion of the egg.

Reconstitution of egg powder: -

Like milk powder, egg powder is also reconstituted before consumption or preparing various food products. About 1/3 part water in yolk powder and 1/7 part water in albumen powder is added for their reconstitution and kept for 7 to 8 hours continuously before it is used.

Meat and Meat Products

Meat:

Meat is a protein rich food and has poor calorific value, as it is deficient in carbohydrate content. Meat is obtained by slaughtering the animal .In our country mainly goat, sheep, pigs and poultry are domesticated for meat production purpose. Buffaloes are also included under meat production categories as there is a great demand of buffen (Buffalo meat) in foreign

countries particularly in urban countries. Cows are also slaughtered for meat purpose because people belonging to a specific community like this meat. The meat obtained from different species is named separately and their contribution in India is as below:

Trade name of meat and their contribution

Type of meat	Trade name	% Contribution
Goat meat	Chevon	32.51
Sheep meat	Mutton	13.90
Buffalo meat	Buffen	13.78
Poultry meat	Chicken	12.49
Pig meat	Pork	7.66
Cow meat	Beef	3.53
Other	-	16.08
<i>Source: FAO, 1978</i>		

In India, chevon and chicken are liked very much and there is a great demand of these in the market. The characteristics of a meat vary with the species from which animal it is obtained.

Dressing Percentage: -

“Dressed portion is carcass weight which is measured in terms of percentage of live weight of an animal.” Variation in the dressing percentage depends on several factors like species, breed, sex, fat content in the carcass, variation in bone, muscle and fat, age and weight of the animal, nutritional status of the animal etc.

Dressing percentage of different meat animals.

Animal	Dressing Out%
1. Hogs	70
2. Cows	40
3. Sheep	50
4. Goats	50
5. Poultry	72

Poultry provide maximum edible portion because the weight of their head, claws and feathers is comparatively very low. Therefore, about 28% only portion is wasted during processing of a broiler.

Nutritive value of Meat: -

(i) Proteins:

The meat of calf, goat, buffalo and poultry contains highest amount of protein. Poultry meat protein attributes highest biological value and possesses all the essential amino acids in sufficient amount needed for the nutrition of human beings. Cooked poultry meat contains 25 to 35% protein while cooked meat of pig and sheep possess 21 to 27% and 21 to 24% protein, respectively. About 50% part of recommended amount of protein to a person is fulfilled by eating 100 gm cooked meat a day. Meat protein has sufficient amount of amino acids.

(ii) Lipids:

Cooked chest meat of poultry contains 1.3% fat only while meat pieces of calf and cows represent 11% and 13 to 30% fat, respectively. Meat fat is a rich source of triglycerides, phospholipids, cholesterol and some vitamins in limited amount, therefore, it is most nutritious. Red meat (sheep, goat, pig) possesses highest amount of saturated fatty acids and cholesterol while poultry meat contains high amount of unsaturated fatty acids and low cholesterol content. This is the reason why poultry meat is less harmful and more digestible. Major portion of fat in poultry is deposited beneath the skin, therefore, in this case skin is not separated but it is eaten alongwith meat after cooking.

(iii) Minerals:

Meat has sufficient amount of all required mineral (except calcium). Major portion of calcium exists in bones and teeth in the body and meagre is found in muscles and other edible organs of the body. Meat is a rich source of iron and phospholipids. Iron is very essential for the synthesis of haemoglobin, myoglobin and some enzymes in the body. Sodium, potassium, magnesium, sulphur, chlorine and iodine are also found in the meat.

(iv) Vitamins:

Generally, meat is the best source of vitamins of 'B' group and it has low concentration of vitamin C. Thiamine, Riboflavin and Niacin vitamins of B-complex group exist in sufficient amount. Pig meat has higher amount of vitamin B complex than the meat of cow, calf, sheep, goat, fish and poultry. Lean portion of pig meat contains 8-10 times more thiamin and maximum amount of riboflavin, pyridine, pantothenic acid and biotin as compared to meat of other species.

(v) Calorific value: -

Due to low carbohydrates content, meat is not considered a good source of energy. Pork possesses high level of fat and energy. Poultry and goat meats are poor source of energy because of low fat content. Meat is considered best food because -

- It fulfils 35% part of the recommended iron requirement and fulfils 100% if liver has been eaten.
- It fulfils 100% recommended fatty acids requirement.
- It fulfils 25-60% part of recommended amount of vitamin B-complex and its supply enhances if pork or liver has been taken alongwith meal

Meat Products:

Raw meat can not be consumed because it is tasteless, off-flavoured and soaked in blood. Therefore, meat is processed to prepared various recipes before consumption.

Boiled Chicken: -

Firstly cut the joints of properly dressed chicken, apply ghee and fill the ground spices through holes of joints. Now hang these 4-5 above the burning fire and cook them. After 35-45 minutes of cooking these become brown, remove from the fire, and consume them alongwith meal after cooling.

Fried Chicken: -

This is almost similar to boiled chicken with difference that it is fried in pan with ghee instead of hanging on the fire. According to method of preparation it may be of two types:- (i) Oven fried chicken and (ii) French fried chicken.

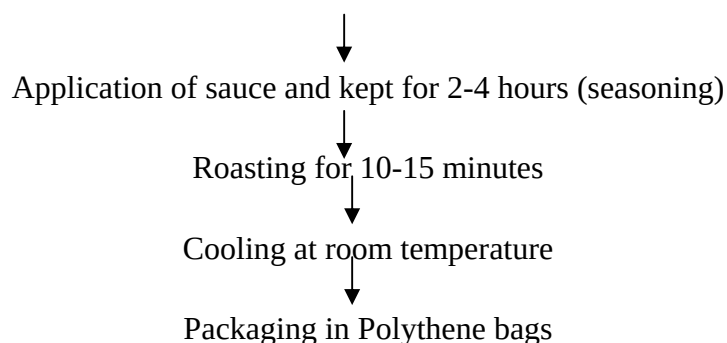
Chicken or Meat Loaf:

It is prepared from raw meat, cooked meat and chicken and is sold in market after packing in aluminum boxes. Loaf may be stored for 4 months at -30°C temperature. Firstly, separate the bone after cooking the chicken, grind it, add chicken broth, sodium isoascorbate and phosphate & mix, it well. Keep the mixture ion freezer. Then grind the raw meat and fat and add other ingredients to it. Thereafter, mixture of cooked chicken is added and freezed

Tandori Chicken: -

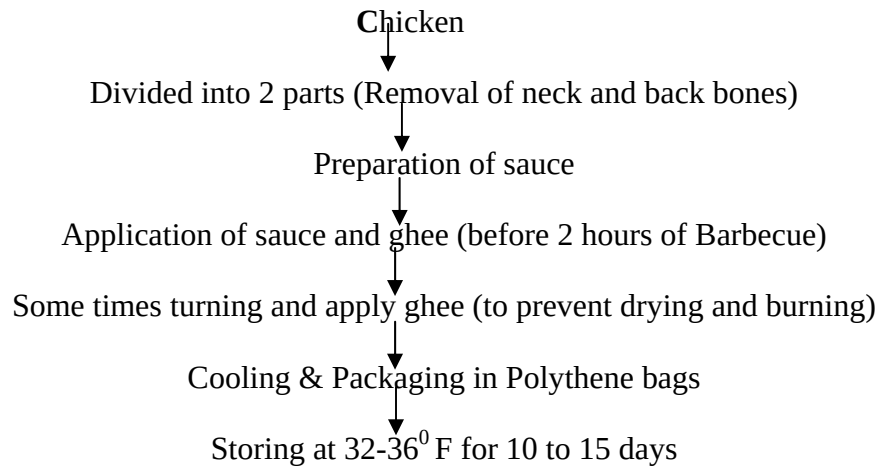
Tandoori chicken is very popular both in India and foreign countries. Broilers weighting 400-500 g are considered suitable for the preparation of tandoori chicken. For its preparation a specific type sauce is used.

Chicken

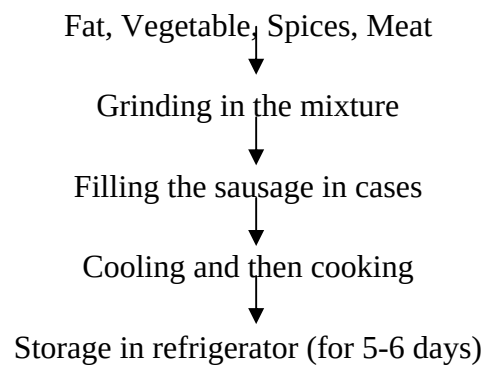


Chicken Barbecue:

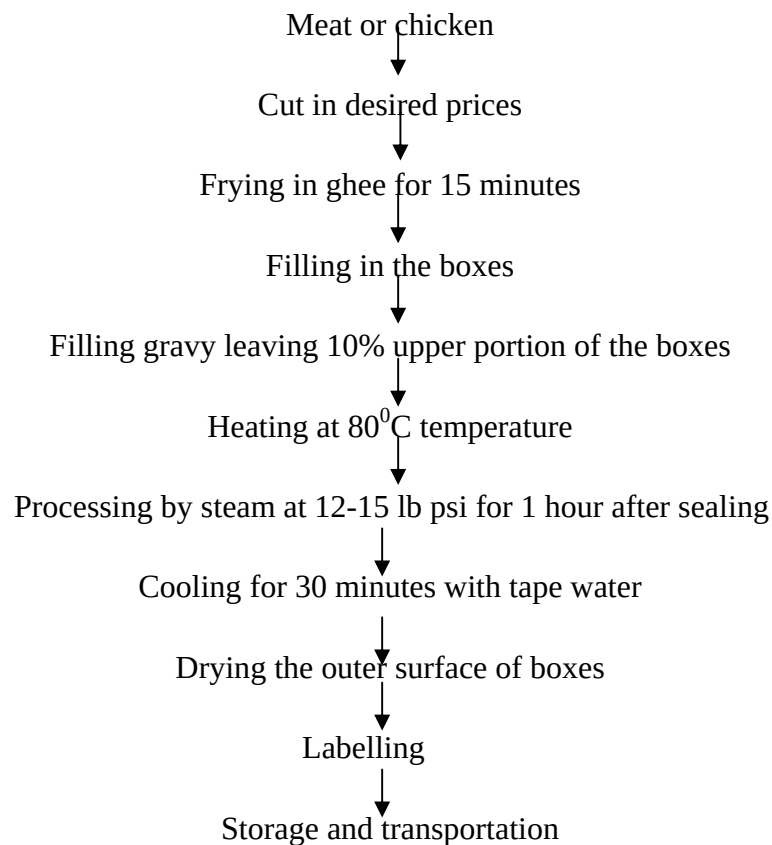
It is a very popular product prepared from broilers. Broilers weighting 700 to 800 g are used and this product is prepared adopting many types of method. Barbecue oven has been developed at CFTRI, Mysor for its preparation and it takes 45-75 minutes depending on the size and temperature of oven. Specific type of sauce is also to be prepared before products manufacturing.



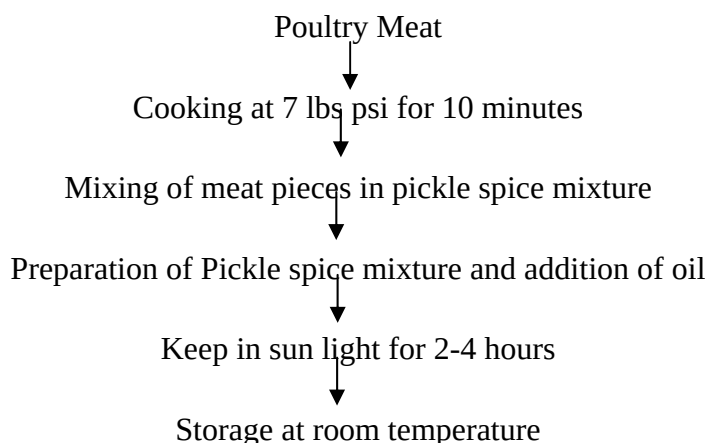
Chicken or Meat Sausage: -



Canned Chicken or Meat: -



Poultry Pickle: -



Chicken or Meat Patties: -

Freeze the patties filled with fine grinded raw meat or chicken. Any antioxidant should be added if fat is to be incorporated it will turn rancid. Patties are fried in ghee before use.

Chicken or Meat curry: -

This product of meat is very popular in our country and is used as a substitute of vegetable. Thus it complements rice and chapaties. First of all meat with bones is divided into small but equal pieces. Now all the ingredients stated above are fried with mustard oil in a pan over open fire. When the mixture becomes brown the pieces of meat are fried in it. Desired amount of water is added and is left for cooking on low flame. When meat separates from the bones easily and cooking flavour is prominent, the pan is removed from the fire. This is called 'Meat curry'.

Suggested Readings:

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