POULTRY NUTRITION

POULTRY NUTRITION

Facts should be considered when feeding poultry:

1-all essential nutrients in right amounts & proportion required.

2-Different standards per age .

3-Palatability of the ingredients.

POULTRY NUTRITION

4-poultry depends completely upon dietary sources for all nutrients (essential AAs., vit.B groups & vit.K).

5-agro-industrial by-products minimize cost of the ration.

6-Optimum level of ingredient inclusion as many of them have a deleterious effects at higher levels.

7-Optimum Ca:P ratio for different purposes.

POULTRY NUTRITION

Nutrients requirements of poultry:

1-Energy requirement:

- Ration for poultry calculated on the basis of ME.
- Poultry eat to satisfy their energy needs when fed free choice, thus must control the intake of all nutrients by including them in a definite proportion to available energy level..

POULTRY NUTRITION

- High energy-cereal grains are the principal energy sources.
- Fat may be added at levels of 3-7% to increase dietary energy concentrations.

Factors affecting feed intake:

1-Energy levels in the ration:

↑ energy level ⇒ ↓ feed intake

↓ energy level ⇒ ↑ feed intake

POULTRY NUTRITION

2-Environmental temperature:(SET, 16-24C)

↑ Temp. ⇒ ↓ feed intake

↓ Temp. ⇒ ↑ feed intake

3-Health of the bird

4-Genetics

5-Form of the feed

6-Nutritive balance of the diet

7-Stress 8-Body size

9-Rate of growth & egg production

POULTRY NUTRITION

2- Protein requirement:

- The amount of protein required is proportional to the energy level in the ration.
- Poultry required the 14 essential AAs.
- ↑ Temp. ⇒ ↓ feed intake ⇒ ↑ protein req.
  ↓ Temp. ⇒ ↑ feed intake ⇒ ↓ protein req.
- Some AAs can met by other AAs:

Cystine ⇒ methionine, Tyrosine ⇒ phenylalanine

Glysine ⇒ Serine

POULTRY NUTRITION

- Overheating or underheating during processing can affect the availability of some amino acids.

3- Mineral requirements:

- The major minerals needed in poultry diets are Ca, P, Na & Cl.
- Trace minerals may be added if feeds grown on soil deficient in them.

POULTRY NUTRITION

A-Calcium & Phosphorus:

- The recommended ratio P:Ca in diet of poultry is 1:1.2 (range 1:1 to 1:1.5)

  For laying hen 1:4 (Ca important for bone & shell formation)
- ↑ Ca in diet ⇒ ↓utilization of Mg, Mn & Zn.
- Inorganic P have a higher availability than organic P
- All P from animal origin & 40% from plant origin (wheat bran & rice bran) is available.

POULTRY NUTRITION

B- Salt (NaCl):

- The amount added depend upon the feed ingredients.
- The recommended level in the ration 0.5-1% of the ration.
- Adult poultry can tolerate much higher inclusion but the water consumption increased.

POULTRY NUTRITION

C- Manganese:

- Def. Of Mn cause perosis with slipped tendon.
- A free flowing Mn suppl. Should normally be included in all poultry feeds.
- Mn needed for egg production & hatchability.
- Mn carbonate, oxide, sulfate & commercial mineral mixture can be used.

POULTRY NUTRITION

D- Iodine:

- Iodine included at rate of 0.5mg but when fish meal included at 5-10% no need iodine suppl.
- ↑ Ca & P in diet ⇒ ↑ iodine requirement

E- Magnesium:

- No Mg Suppl. Needed for poultry ration.
- ↑ Mg in diet ⇒laxation

POULTRY NUTRITION

4-Vitamin requirements:

A- Vitamin A:

- Liberal supply of vit.A or carotene is needed for normal growth & health.
- Def. Symptoms: retardation of growth, emaciation, staggering gait & ruffled feathers, reduced immunity
- Sources: fish liver oils & other animal sources.

POULTRY NUTRITION

B- Vitamin D:

- Vit.D required for bone formation, egg production, reproduction & prevention of rickets.
- Def.symptoms:poor growth, lameness & rickets.
- Poultry do not exposure to sunlight, ration must suppl. With vit.D.

POULTRY NUTRITION

C- Vitamin E:

- Vit.E in vegetable is not readily available as in oil concentrates.
- Vit.E essential to prevent encyphalomalacia or crazy chick disease.

D- Vitamin K:

- Def. of vit.K $\Rightarrow$ delay clotting time of the blood & produce serious hemorrhage
- All mixtures should be suppl. With vit.K
- Treatment by sulfonamide $\Rightarrow \uparrow$ vit.K req.

POULTRY NUTRITION

E- Riboflavin:

- Def. of vit.B2 ⇒curled-toe paralysis, dwarfism & degeneration of nerve trunks.
- Requirement: Broilers & breeder 4.4mg/kg
  Layers 2.5 mg/kg ration

F- Thiamin:

- Def. of thiamin ⇒ nerve deg., convulsion & heart abnormalities.

POULTRY NUTRITION

G- Niacin:

- Def. of niacin ⇒inflammation of tongue & mouth cavity (black tongue).
- Young chick required niacin more than adult due to less bacterial action synthesis.

H- Vit.B12:

- Animal proteins are good sources of vit.B12.
- Def. of vit.B12 ⇒irritability, poor feathering & poor hatchability.

POULTRY NUTRITION

Feeding space:

1 inch feeder space /chick for 2 weeks age & 2 inches after that.

Water:

- Bird drink about twice as much water by weight of feed consumed.
- Water consumption increase or decrease according to the environmental temperature.
- Some medications are administered in the drinking water.

FEEDING OF BROILERS

FEEDING OF BROILERS

Age / Nutrients	Protein (%)	ME (Kcal/kg)
Starter ration (1-2weeks)	22-24	2800
Grower ration (3-4 weeks)	20-22	3000
Finisher ration (5-6 weeks)	18-20	3200

FEEDING OF BROILERS

$$\text{Feed conversion (FC)} = \frac{\text{Feed intake (g or kg)}}{\text{Weight gain (g or kg)}}$$

Feed conversion of broilers = 2.2

Factors affecting feed conversion:

1-Type of feed fed

2-Strain of the birds

3-Environmental temperature

FEEDING OF BROILERS

4-Age and weight of the birds

5-Diseases and condemnations

6-Rodent & flying bird control in feeding area

7-Antibiotics and medications ⇒improve FC

8-Debeaking & size of baby chicks

9-Feed wastage

10-Form of the feed

FEEDING OF BROILERS

Broiler breeding pullets:

- Chickens bred for meat production grow rapidly & reach sexual maturity at early age ⇒too many small egg & not good for hatching.
- Bird kept for breeding purposes, it is necessary to slow down their rate of growth & development of sexual maturity.

FEEDING OF BROILERS

Methods used:

1-Restricting feed intake to approximately 70% (when pullets at 7-9 weeks till 23 weeks),or

2-A skip –a-day program involves full feeding every other day, or

3-Feeding a diet containing 10% protein.

FEEDING OF BROILERS

Energy feeds:

- Grain, grain by-products and animal & vegetable fats and oils supply the most of energy in the poultry diets.
- Corn is the most common grain used in formulating poultry diets
- Other grains such as grain sorghum & wheat substituted part of corn
- Animal & vegetable fats added in limited amounts (5-10% of the diet)

FEEDING OF BROILERS

Protein supplements:

- Protein suppl. Added to provide the essential AAs.
- Several protein sources used to achieve a better balance of the needed AAs.
- Animal protein sources are more variabl in their amino acids than plant protein
- AAs req. for poultry differ tha other animals in that glycine & serine are dietary req. & required glycine for uric acid formation.

FEEDING OF BROILERS

A-Plant protein:

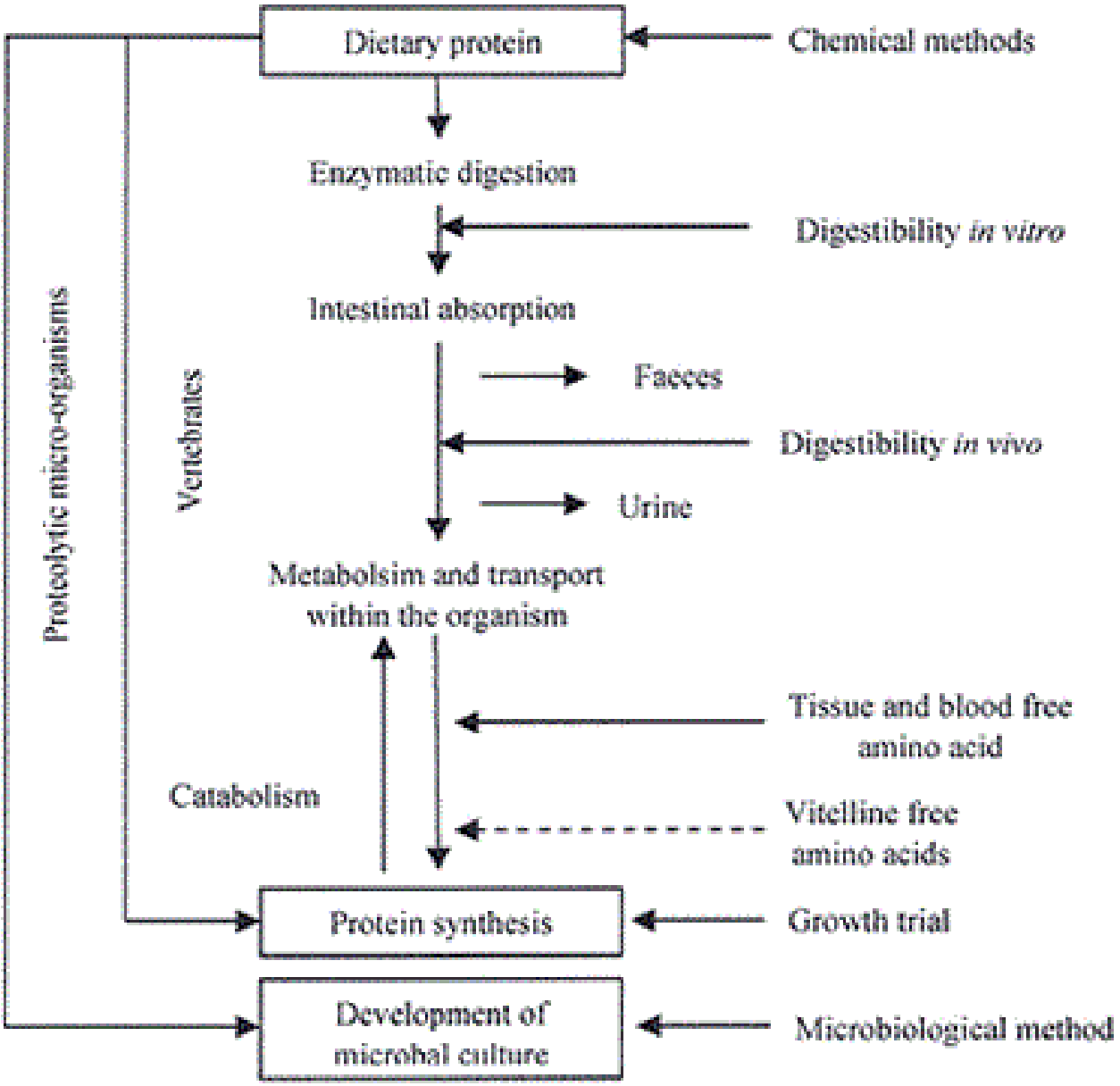
- Soybean meal is most commonly plant protein source & has a better balance of AAs than other plant protein (cottonseed meal, corn gluten meal, linseed meal).
- Cottonseed meal used in grower poultry ration to replace up to 50% of the soybean meal, while linseed meal not more than 3-5% of diet.

FEEDING OF BROILERS

B-Animal protein:

- The most commonly used are fish meal, meat by-products, milk by-products, blood meal, feather meal & poultry by-product meal.
- Fish meal have a good balance of AAs, but must not used in large amount (used at 2-5%) to avoid fishy flavor in eggs & poultry meat.

Figure 5. Basis of methodologies in the estimation of amino acid availability



FEEDING OF BROILERS

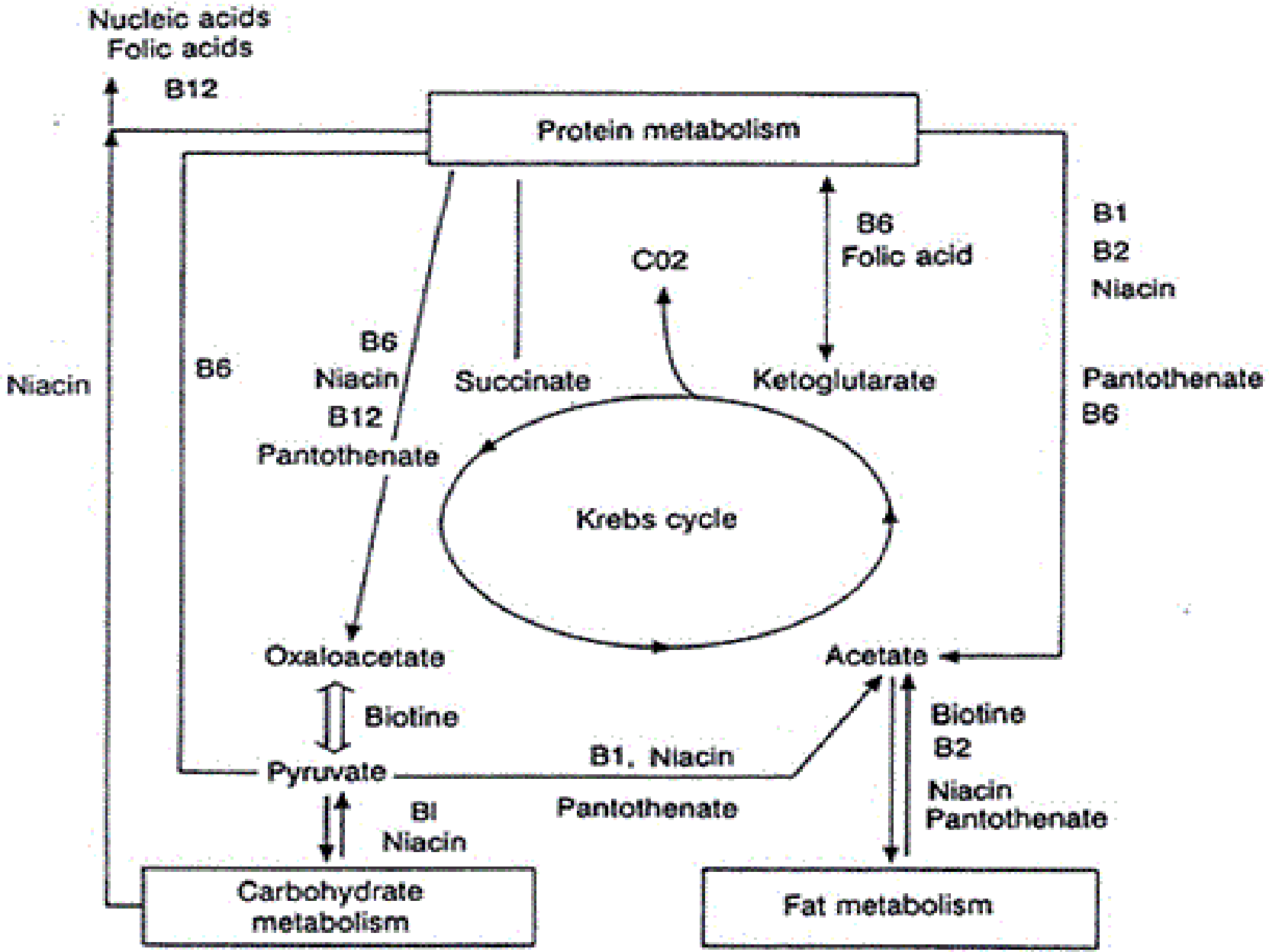
Mineral supplements:

- Sources of Ca in poultry diets are ground oystershell, limestone, bone meal, dicalcium phosphate.
- Inorganic P supplied by bone meal, dicalcium phosphate, rock phosphate.
- Na & Cl adding as common salt (0.5-1% of diet)
- Mn (Mn sulfate), zn (Zn sulfate)

FEEDING OF BROILERS

Vitamin supplements:

- Natural feedstuffs provide some vitamins for poultry.
- Vitamin premixes are commonly used to provide the required vitamins in poultry.


Nucleic acids
Folic acids
B12
Protein metabolism
B6
Folic acid
B1
B2
Niacin
C02
Niacin
B6
B6
Niacin
B12
Pantothenate
Succinate
Ketoglutarate
Pantothenate
B6
Krebs cycle
Oxaloacetate
Acetate
Biotine
Biotine
B2
Niacin
Pantothenate
Pyruvate
B1, Niacin
Pantothenate
Bl
Niacin
Carbohydrate metabolism
Fat metabolism

FEEDING OF BROILERS

Feed preparation:

- Commercial feeds for poultry as mash, pellets or crumbles.
- Less wastage when using pellets or crumble and poultry grow faster and more commonly used for broilers and turkey than for laying hens (laying hen tend to become too fat unless they are on the restricted feeding program.

NUTRITION OF LAYING HENS

NUTRITION OF LAYING HENS

Nutrient requirements of laying hens:

1-Energy requirement:

- For maintenance (2kg wt.) = 220 Kcal

  For 70% production = 130 Kcal

  For 1 g gain/day = 3 Kcal

- The usual energy conc. Is 2.8 Mcal ME/kg diet

↓ Energy conc. Than 2.3 Mcal ⇒↓energy intake & egg production

NUTRITION OF LAYING HENS

2-Protein requirement:

- Laying hen receiving diet containing 3.1 Mcal ME/kg DM require 16.5% protein.
- To get maximum economic return from laying hen flock, a feed efficiency of 1.6-1.8 kg of feed per dozen of eggs produced is need.
- A laying ration should contain about 15% protein based on 2900 Kcal ME/kg of diet.

NUTRITION OF LAYING HENS

Effect of environmental temperature:

- Small light body weight hens consumes:

  In Summer ⇒90g feed (19% protein ⇒ 17g protein/ hen/ day).

  In Winter ⇒ 110g feed (15.5% protein ⇒ 17g protein / hen / day)

NUTRITION OF LAYING HENS

Essential AAs for laying hens:

- Leucine, isoleucine, lysine, methionine, tryptophan and arginine.
- Methionine is first limiting Aas for egg production.
- Mash for laying hens should contain not less than 3-4% animal protein supplement.
- Feather are high in sulfur amino acids (required methionine).

NUTRITION OF LAYING HENS

Fat supplement:

- Fat addition $\Rightarrow \uparrow$ egg yield in winter
- Fat addition $\Rightarrow \downarrow$ amount of feed required / dozen eggs.

NUTRITION OF LAYING HENS

3-Mineral requirements:

A-Calcium:

- Laying birds need large amounts of Ca because egg shells composed entirely of $CaCo_3$

↓ Ca in laying ration ⇒ ↓ egg production & egg shell weak.

- Bird stored Ca for about 10-14 days before the first egg was laid in the marrow of long bone.

NUTRITION OF LAYING HENS

B-Phosphorus:

- Protein supplement used in poultry rations (mat meal, tankage, fish meal & dairy by-products) usually be sufficient in phosphorus.
- Plant protein supplement (SBOM) should supplement with P & Ca.
- Inorganic P is more available than phytate P.

NUTRITION OF LAYING HENS

C-Manganese:

↓ Ca in laying ration ⇒ ↓ egg production & egg shell weak & ↓ hatchability.

- ¼ lb Mn sulphate added to ton of mash fed without grain & ½ lb to mash fed with grain

D- Iodine:

↓ Iodine in laying ration ⇒ goiter

- Iodized salt must be used instead of common salt in the ration of poultry.

NUTRITION OF LAYING HENS

E- Selenium:

↓ Se in laying ration ⇒Exudative diathesis

F- Zinc:

↓ Zn in laying ration ⇒skeletal abnormalities, ataxia, necrotic dermatitis & thin shell & hyperkeratinization of epidermis.

G- Salt:

- 0.5-1% of the total ration salt

NUTRITION OF LAYING HENS

4-Vitamin requirements:

A-Vitamin A :

- Laying hens require higher content of vit.A in their feed in very hot weather than cold because they consume less feed.
- ↓ vit.A in laying ration ⇒Nutritional roup (sticky materials from eye & nostrils)

NUTRITION OF LAYING HENS

B-Vitamin D :

↓ vit.D in laying ration ⇒thin shell eggs, ↓ egg production & hatchability, breast bone become soft & bones of legs & wings become fragile.

C-Riboflavin & vit.E :

↓ Riboflavin & vit.E in laying ration ⇒low hatchability

NUTRITION OF LAYING HENS

Phase-feeding of laying hens:

To adjust nutrient intake in accordance with the rate of egg production

A-Phase I (most critical period):

During 20 W period (22-42 W of age) pullet :

1-↑ egg production from zero to peak (85-90% production).

2- ↑ body weight from 1300 to 1900g.

3- ↑ egg size from 40g/egg at 22W to over 56g/egg at 42W of age

NUTRITION OF LAYING HENS

B-Phase II :

- Period after 42W of age when the hens attained mature body weight
- The period ranged from 42-72W of age.

Effect of temp. on egg shell:

- Hot weather $\Rightarrow \uparrow$ respiration rate $\Rightarrow \uparrow$ Co2 loss $\Rightarrow \downarrow$ blood bicarbonate level $\Rightarrow \downarrow$ egg shell formation

NUTRITION OF LAYING HENS

Stage of egg production:

- Egg production hen usually cover a period of 15 months
- Commences at 22W of age ⇒ peak at 28-30W of age ⇒gradually decline to 65% after 15 months of lay.
- ↑ lighted period ⇒ ↑ feed intake & ↑ stimulation of pituitary gland ⇒ ↑ egg laid

NUTRITION OF LAYING HENS

Feeding systems:

1-Whole grain method

2-Grain & mash

3-All mash: fed at first 8W

4-Wet mash NUTRITION (more palatable)

5-Pellets

- With grain fed must used insoluble grit
- Also fresh green feed is fed to poultry.

NUTRITION OF LAYING HENS

Nutrition and egg quality:

A-Egg size (egg weight):

Factors affecting egg size:

1-Level of protein in diet:

- 14-20% CP rations ⇒balanced AAs ⇒heavier eggs
- The choice of protein level in layer diet depend on accurate evaluation of extra-cost for the additional protein compare with the income from larger eggs obtained.

NUTRITION OF LAYING HENS

2-Energy intake

3-Mineral & vitamin levels:

- ↑ Ca & ↓ vit.D ⇒ ↓ egg weight

4-Level of linoleic acid:

- Linoleic acid ⇒ formation lipoprotein in liver ⇒ ovary uptake by ova ⇒ higher egg weight

5-Strain

NUTRITION OF LAYING HENS

B-Shell quality:

- The quality of egg shells depend on the presence of adequate levels of vit.D_3 & certain minerals including Ca, P & Zn.
- Def. or imbalance of vit,D_3 , Ca & P $\Rightarrow \downarrow$ shell thickness & misshapen eggs $\Rightarrow \downarrow$ egg production
- $\downarrow$ Mn $\Rightarrow$ thin & brittle-shelled eggs
- The blood carbonate is the source of carbonate in the shell formation

NUTRITION OF LAYING HENS

- Very hot weather ⇒ poor quality egg shells
- End of laying period ⇒falls egg shell quality due to failure in Ca metabolism & ↓ Ca of ration
- Sulphonamide drugs ⇒thin shelled eggs
- Insecticides & fungicides in grains ⇒malformed eggs
- Rancid cod liver oil in diet ⇒rough shells
- Diseases ⇒poor shell quality

NUTRITION OF LAYING HENS

C-Internal egg quality:

- The nutritive content of the egg depends upon the level of these nutrients in the diet of laying hen
- Suitable iodine in diet $\Rightarrow \uparrow$ I content of eggs
- Def. of vit.B2 $\Rightarrow$slight yellowish-green tinge in albumin

NUTRITION OF LAYING HENS

D-Yolk colour:

- The colour of egg yolk depend upon the presence of carotenoid pigment (xanthophylls) in the ration

(fresh & good dried green feeds & feed additives)

- When 30% yellow maize or 5% good quality alfalfa or up to 22mg xanthophyll/kg ⇒ deep-yellow yolks
- Highly pigmented plants ⇒undesirable coloured yolks
- Large amount of untreated CSM ⇒brown mottled yolk & pinkish tint of albumin
- Pimento pepper in diet ⇒ orange-red yolks

NUTRITION OF TURKEYS

NUTRITION OF TURKEYS

- The general principles of NUTRITION turkeys are similar to those for NUTRITION broilers. Major differences are in the protein levels required and the importance of the vitamins biotin & pyridoxine in turkey diets
- Poults must be fed & watered as soon as possible after hatching & if feeding delayed beyond 36h after hatching ⇒difficulty learning to eat & drink.
- Vits. & minerals suppl. of the diet essential for good hatchability of turkey eggs.
- At 10-12W of age separate hens from toms

Period	Protein (%)	ME (Kcal/kg)
First 3 weeks	30-33	2930-3000
0-4 W	28	2930-3000
4-8W	26	2900
8-12W	20-22	3100
13-16W	19	3200
17-20 W	16	3275
21 W-market	13-14	3350
Laying hen	15-18	2925
Peak production	19	2755

FEEDING OF TURKEYS

Nutritional disorders of turkey:

1-Leg weakness disorders:

Cause: def. of Ca, P, vit.D, choline, biotine, folic acid, Mn & zinc.

2-Enlargment of hock joint:

Cause: def. Of niacin, biotin, vit.E & zinc.

3-Footpad dermatitis:

Cause: biotin deficiency

Symptoms: sticky droppings adhere to the feet & cause dermatitis

FEEDING OF TURKEYS

4-Pendulous crop:

Cause: yeast proliferation in crop

Symptoms: gas production from fermentation of carbohydrate ⇒interfere with passage of ingesta from crops to proventriculus ⇒pendulous crop

Treatment: fungal inhibiting antibiotics

5-Ascitis:

Cause: high salt intake ⇒fluid accumulation in body cavities

FEEDING OF TURKEYS

6-Exudative diathesis:

Cause: Selenium deficiency

7-Aflatoxicosis:

- Aflatoxin affect the immune system ⇒increase susceptibility to disease
- Mycotoxin ⇒hemorrhage may bluish the carcass

NUTRITION OF DUCKS & GEESE

NUTRITION OF DUCKS & GEESE

- Commercial feeds in mash, pelleted or crumbles form available for ducks & geese
- If a commercial feed for ducks & geese is not available, chicken feed may be used (not contain coccidiostat)
- Geese will start to eat pasture when they are only few days old & feed additional grain if pasture is not of good quality.

FEEDING OF GEESE

Period	Protein (%)	ME (Kcal/Kg diet)
0-4 W (starter)	20	2900
After 4 W (grower)	15	3000
Breeding	15	2900

FEEDING OF DUCKS

Period	Protein (%)	ME (Kcal/Kg diet)
0-2 W (starter)	22	2900
2-7 W (grower)	16	3000
Breeding	15-18	2900