

RECENT TRENDS IN FEEDING OF LAYER PULLETS

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The productivity of layers increased considerably during the recent past in our country, which is far above many developed nations in the world. This has been achieved with the intensive selection pressure for greater egg number and improved management practices including balanced feeding, health care and stringent and high level bio-security practices adopted. An hen housed production of 320 eggs in 72 weeks of age could be possible due to decreased age at first egg (age at sexual maturity), which was about 20/21 weeks two decades back and at about 17 weeks of age at present. Though the sexual maturity is reduced but the pullet has to attain the desired (required) body weight at 17 weeks (1160g) of age which was the target at 21 weeks of age few year back. In other words, we need to enhance the growth of the pullet by about 130 g with in 17 weeks of age to attain the desired uniformity in the flock growth and maximum number of eggs from a batch.

In addition to the reduced age at maturity, there has been a lot of changes in management of bird starting from increased stocking density per unit of area, increased incidence of new emerging diseases, increased productivity of birds, imbalance in diets, presence of exo- and end- toxins in the feed, rapid variation in climate, etc., causing severe stress on bird and resulting in sub-optimal growth. The pullets during pre-laying period are subjected to different stressors like vaccination, handling debeaking, deworming, transportation from chick to grower and to layer sheds which further hampers the growth of pullets. The under weight of pullet at maturity result in more number of pullet (small) eggs, uneven production, low hen house egg production and prolapse. Reduced age at sexual maturity has an inherent disadvantage due to low nutrient intake, which is further affected by offering low-density grower diets. This resulted in sub-optimal body weights at the time of shifting birds to layer cages and uneven growth at maturity. The under weight birds also be under stress due to diverting nutrients from body organs for sustaining production and this may result in immune break down. The under weighed birds will also be deprived of many basic requirements like space feed, ventilation due to social hierarchy with the flock. Though the egg marking in our country is predominantly based on number, but the smaller (pullet) eggs are not preferred by many traders and fetch 35-40% fewer prices compared to the slandered egg size. Since the body weight of pullet at maturity is having a direct linear correlation on egg size, there is a great chance to loose when the flock is not uniform in body size particularly when birds are under weight compared to the prescribed standard weight.

The traditional method of feeding layer pullets (**Table 1**) by offering starter diet up to 8 weeks and grower diet up to 17/20 weeks need to be reviewed to increase the length of effective biological egg laying cycle and corresponding reduction in grower period. Feeding of the growers with the traditional low-density diets may not support the increased / changed nutritional demand for the present high yielding layers. Due to several obvious reasons, researchers, industry and poultry farmers have neglected the nutrition of growing chicken. Often these birds are fed diet prepared from feed ingredients relatively not preferred for chick / layers. The typical grower feed contains low energy (2350-2450 kcal ME/kg), protein (16-17%) and proportionately low amino acids profile. This low nutrient density can be achieved only by using greater proportion of high fibrous diets, which has low digestibility co-efficient for chicken. Another practical aspect of feeding grower is utilization of feed ingredients, which is less preferred for chick and layers. Utilization of such “poor quality feed ingredients” cannot support the “high nutrient demand” of the pullets also such poor quality feed ingredients are a potential source of undesirable foreign materials for poultry. Further high dose of antigen pumping in to the chicken during pullet age, which is practically deprived of balanced nutrition, is severely hampering the pullet performance and immunity. This is resulting in immune breakdown, which is exhibiting as “dermatitis”, “gizzard erosion” and “sub-clinical infection”.

Table 1. Typical phase feeding program

Phase	Protein, %	ME, kcal/kg	Age
Starter	18-20	2700-2750	Done - 8wk
Grower	15-16	2350-2450	9wk - 17wk
Pre-layer	16-18	2400-2500	> 17 wk

Normally, we make attempts to correct low body weight at about 17 weeks of age (pre-layer period), at which the pullets are housed in layer sheds. Correcting body weight during pre-laying time by offering high energy and or protein diets may result in more fat deposition and subsequent loss of egg production. It is always better to monitor the body weight of pullets at regular interval and make necessary modifications in feeding and management as and when required, instead of “hurriedly” making attempt at the “last minute” to rectify the long pending “defect”. To produce the pullet with the desired body weights at maturity various methods are have been tried by optimizing the nutrition from day one till the maturity. The available data suggest that a birds should consume a minimum of 18 Mcal ME, 900 g balanced protein to achieve the desired body weight at 18 weeks of age. Modulate the nutrient density in the feed from time to time depending on the necessity, and age may not be really an important criterion to change from “starter to grower diet”, “grower to pre-layer diet”. It is important to note that the growth of pullet skeleton is reached maximum at 15/16 weeks of age. Therefore the growth correction, if required should be attempted before the birds attain 16 weeks of age by improving the management and feeding practices. Attempts to enhance growth at later age (i.e. > 16 weeks) may result in more fat deposition and prolapse during laying phase. Attaining the desired body weight will also reduce age at sexual maturity besides increasing the size of pullet egg-**Table 2.**

Table 2. Effect of mature body weight on sexual maturity and size of pullet egg

Body weight (18 wk), g	Age at 1 st egg	Pullet egg weight, g
1000	150	40.7
1100	147	42.0
1180	146	43.7
1280	145	45.5

Few studies were conducted to find out the optimum requirement of essential nutrients for layer growers for better growth and maximum performance during laying period.

Phase feeding

Chicks should be fed in phases considering the realized body weight and standard weight of the pullet at a particular age. This should be verified at least at every two-week interval. Depending on the need, the composition of the diet should be modulated to achieve the set targeted body weight. The typical / conventional phase feeding program (Table 1) may not be relevant at all occasions. Phase feeding should be done / implemented considering the body weight of the flock, environmental temperature, etc.

The feeding program should be flexible

- * Adopt the program as an individual case
- * Desired body weight per age is criterion- not the age of the bird
- * Pre-layer diet is only to condition calcium (Ca) reserves in the bird

Pre-layer calcium nutrition

This is generally practiced to strengthen the Ca reserves in the bird before the pullet starts egg production. For this purpose the level of Ca in diet is increased so as to increase the Ca deposition in the medullary bones. The increased Ca reserves will help the bird to sustain egg production and shell quality when the intake of Ca / P deviate slightly from the required. At this age, no serious attempts should be made to enhance the body weight of the pullet.

In the pre-layer diets (17-20 weeks of age), provision should be given to enhance the calcium reserves within the body of pullet to support peak egg production in the subsequent laying phase. The levels of calcium in pre-lay diet should be maintained based on the uniformity of flock, body size, history of wet litter in the farm. When the body weight of the flock is uniform 1% calcium layer diet is preferred and can be fed up to 5% egg production, a 2% calcium diet is preferred to introduce at 17 weeks of age till the flock achieve 10-15% of egg production, alternatively when the flock is uniform and weighing higher than the standard body weights, a regular layer diet containing 3.5% calcium can be used in the pre-lay diet. The high calcium diets in the pre-layer diet should be used judiciously considering the history of wet litter in the farm. Adequate feeder and floor space should be an integral part of successful grower feeding in achieving the desired body weight at maturity.

Three approaches are in practice

1. 1% Ca diet up to 5% egg production
2. 2% Ca diet for pre-layer at 17 weeks of age
3. Early introduction of 3.6% Ca diet

1) 1% Ca diet up to 5% egg production

This approach is best when the flock / farm is having the history of wet litter

Enhances the efficiency of Ca utilization

Ideally change to regular layer diet (3.6% Ca) when the production reaches 0.5% in the flock, but practically better to change when the flock attains 5% egg production.

2) 2% Ca diet for pre-layer at 17 weeks of age

This is the safest approach and commonly followed

Change to regular layer diet at 10-15% egg production

3) Early introduction of 3.6% Ca diet

Good when the flock is uniform in weight

When the flock attains desired body weight and start production early

Increase light and dietary Ca level simultaneously

Not good when the farm is having history of wet litter

When ever the levels of Ca in diet increased either to 2% / 3.6%, there is a possibility of wet litter in the farm (**Table 3**). The normal physiological condition is tolerable and if required, some gut acting astringents can be tried to minimize the moisture content in litter.

Table 3. Effect of pre-layer Ca level on excreta moisture content

Ca, %	Bird age, days			
	147	175	196	245
1	71.4	77.2	74.1	65.5
2	71.6	79.2	73.9	63.9
3	72.1	80.3	75.3	63.9
4	77.0	81.0	76.0	69.4

Relation between gout and Ca level in diet

Excess protein?? In diet

Excess Ca??? In diet

Take care of electrolyte ratio (Na+K: Cl) more alkaline urine

1-2% ammonium chloride

0.6% MHA

The data available suggest that the dietary level (15 to 20%) / intake (1.28 to 1.62kg) of protein is not effective in influencing the body weight of layer pullets (1-20 weeks of age)-**Table 4**.

Table 4. Effect of protein level on pullet growth (day 1 to 20 wk) and nutrient intake

CP, %	Body weight, g	ME intake, Mcal	CP intake, kg
15	1345	23.3	1.28d
16	1359	22.9	1.28d
17	1323	22.9	1.37cd
18	1327	22.0	1.39c
19	1344	22.9	1.53b
20	1380	23.0	1.62a

Though the protein intake was reduced from 1.40 kg to 1.29kg / bird at 20 weeks of age, increase in ME content from 2650 to 3150 ME/kg diet with a proportionate intake of 20.6 to 22.5 ME Mcal/bird) increased the body weight of the pullet (**Table 5**). These results also imply that the energy is the primary constraint in layer diet compared to protein.

Table 5. Effect of dietary energy on pullet growth and nutrient intake

ME, kcal/kg diet	Body weight, g	ME intake, Mcal	CP intake,kg
2650	1320c	20.6c	1.40a
2750	1378bc	21.0bc	1.37a
2850	1422ab	21.8ab	1.37a
2950	1489a	22.1ab	1.35ab
3050	1468a	21.4abc	1.26c
3150	1468a	22.5a	1.29bc

The research findings clearly suggest high energy (2700-2800 kcal ME/kg) and low protein (16%) levels in grower diet than the levels being adopted in practice. Since the environment plays a critical role on performance of chicken, due considerations should be given to changes in environmental temperature and relative humidity while adopting the levels of nutrients in grower diets.

Achieve the desired body weight in growers

The desired body weight corresponding to the age should be monitored frequently at regular intervals. Changes in nutrient input should be done considering the difference in body weight between the standard and realize. The absolute intake of metabolizable energy, protein and critical amino acids should be modulated to achieve the desired results. The inherent limitations in digestive system of chicken during first few days after hatch should be taken into account for better utilization of nutrients. To realize better performance the newly born chick should get its feed as early as possible, preferably within 10 hours after hatch. If fat supplementation is desired, try to provide vegetable fats, which contain high proportion of unsaturated fatty acids. Animal fats can also be used with vegetable fats at 1:4 ratio. Chick diet should invariably contain antioxidants, adequate vitamins, liver tonics, toxin binders and probiotics or gut acidifiers to sustain the existing stress factors and also to achieve the required body weight as per specifications.

- Monitor the body weight at regular intervals
- Change the nutrient allowances as desired / demanded
- Improve feed intake by supplementing fat / molasses, pelletization of feed
- Delay photo stimulation when the flock is under weight
- Supplement fat with labile methyl group in diet
- But high weight relative to skeletal growth may result prolapse

In order to achieve the desired body weight ensure, optimum intake of nutrients by balancing the dietary concentration of essential nutrients like ME, balanced protein, calcium, phosphorus, trace minerals and vitamins. The **Table 6** shows optimum intake of nutrients and feed for layers at different ages. The calculated optimum cumulative intake of ME, CP, lysine and methionine at different ages are give in the table, these values can be taken as guidance. The activity of bird, anticipated growth rate, maintenance allowances and digestibility co-efficient of nutrients should be considered while fixing the dietary allowance of different essential nutrients at different ages. Depending on the gap between anticipated growth and realized body weight, fix the nutrient allowances in the diet. It is not always better to consider the crude protein level in diet., balanced protein is more critical in terms of the ratios of amino acids in proportion to the protein, rather than crude protein per se.

Table 6. Target body weight and anticipated intake of feed and nutrients in layer pullets

Age, wks	Body weight, g	Intake/bird			
		ME, Mcal	CP, kg	Lysine, g	Methionine, g
6	410	2.8	0.21	10.6	4.6
8	580	4.6	0.34	17.3	.5
12	900	8.1	0.58	28.7	12.5
15	1070	11.2	0.79	38.5	16.8
17	1160	13.4	0.94	45.5	19.8
20	1360	17.3	1.20	58.0	25.3

Tips to enhance the growth of pullets

- * Change the feed composition as per the need. Age should not be a criterion
- * Chick diet should contain immune modulators like vitamins, trace minerals, essential oils, high levels of methionine, etc.
- * Liver tonics, lipotropic factors, choline chloride should be used as regular feed additives in grower diet.
- * Offer the required floor, feeder and waterer space to each bird
- * Animal fat may is not preferred in chick diet
- * Fat supplementation is essential to increase energy level in diet. Add fat emulsifying agents to increase fat digestibility in chicks.
- * Probiotics, gut acidifiers or prebiotics need to be supplemented depending on the need of the birds.
- * Toxin binders, b-complex vitamins will minimize ill effects of fungal toxins in diets.