Nutritional strategies for feeding broiler breeder hens

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As genetic progress annually enhances broiler and breeder performance, changes in bird management must occur. Indeed, as broiler advances are continuous, one should also expect that breeder changes will also occur on a similar timeline.

Knowledge related to broiler breeder energy and amino acid requirements, stress management and waste elimination will dictate new management techniques. For example, research has shown that pullet rearing may have a dramatic effect on subsequent hen performance.

Recommendations for pullet rearing programs will continue to focus not only on body weight but body composition as well. Breeder feed formulation will be developed to optimise pullet body composition and improve chick production.

Flock differences

There are large flock differences which relate to chick production. Breeder hen performance statistics show that countries such as the United States significantly lag behind the performance figures on the same breed compared to other areas in the world.

These differences are especially evident with the heavier, fast growing/high yielding broiler breeds.

Many US companies focus only on pullet costs and often neglect what impact these changes in pullet rearing may have on subsequent hen performance. Controlling costs are essential for a company to compete, but there must be a balance between cost reduction and performance.

Variable	Starter: (%) crude protein		
	12%	16%	20%
Body weight uniformity (%)	51.5	68.3	79.1
Shank length (mm)	75.3	77.3	77.5
Breast weight (g)	81.0	94.7	113.0
Abdominal fat (g)	11.8	5.2	0.4

Table 2. Effect of starter crude protein on pullet flock uniformity and body composition at six weeks of age (Adapted from Hudson et. al., 2000).

Basic knowledge required

There are many opinions as to why certain countries have better flock performance; clearly feed formulations, feed management, body weights and body compositions differ.

There is a great wealth of information available on nutrition and management of broiler breeders, but the industry often lacks basic knowledge of pullet and breeder hen metabolism and nutrient requirements for optimal performance.

Though many companies offer feed and body weight guidelines for rearing pullets, it seems that much of the industry practices are based more on circumstantial opinions and trial by error rather than scientific evidence and documented solutions.

Therefore, the intent of this article is to describe some of the changes that may take place in broiler breeder nutrition and management and to add fundamental knowledge describing relationships between nutrition, feed curves, bird body composition and hen performance.

Rearing broiler breeders for optimum chick output is a complex and multifaceted undertaking.

Pullet nutrition and feeding, as one portion of that undertaking, is constantly in flux as genetic packages and management styles change.

Nutrient modulation during the replacement phase can and does influence a number of important factors involved in the lay period. Unfortunately, final egg/chick numbers can be so far removed in time from nutritional changes in rearing that correlation to production can be difficult.

Research programs

A number of research programs have looked at pullet nutrition and correlated changes in diet and the subsequent effect on reproductive performance.

Protein and amino acid levels of the pullet starter, developer, pre-breeder and breeder feeds have been investigated in a number of laboratories. Results become difficult to interpret because feed intake varies and this results in differing protein intakes even when dietary crude protein levels are similar.

Dr Robert Teeter, Oklahoma State University, has reported that increased crude protein through 28 days of age improves flock uniformity and body weight gain (Table 1).

Table 1. Effect of protein consumption on flock uniformity through to 28 days (Robert Teeter, Oklahoma State University).

Cumulative protein (g)	Average BW	CV	BW Bottom 25%
209	540	11	462
178	479	13	399
164	431	20	319
159	426	25	288
149	409	29	257
140	394	23	278
136	387	25	264
127	368	30	230

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Reproductive performance enhancements have been noted in a trial by Lilburn et al (1992) when increased protein levels were fed throughout the rearing period in quail, or during the prelay period in broiler breeders in trials conducted by Brake et al (1985), Cave (1984), Lilburn and Myers-Miller (1990).

Trials by Walsh and Brake (1997) indicated that breeder female fertility increased if protein intake to 20 weeks of age was increased.

Early protein nutrition

Broiler breeder research at Auburn University has explored the influence of early protein nutrition on body composition and reproductive performance. In the first study, pullets were fed isocaloric starter diets with 12, 16 or 20% crude protein to six weeks of age.

Amino acid densities were scaled to the protein levels. Protein intakes to six weeks were 177, 231 and 278g for the 12, 16 and 20% protein treatments, respectively.

Flock uniformity, shank length and breast meat were enhanced by dietary crude protein intake, while carcase fat was reduced (Table 2).

This relationship is supported by internal research conducted at Oklahoma State University which indicated higher early crude protein intake increases lean tissue accretion, skeletal mass and flock uniformity.

Variable	Starter: (%) crude protein		
	12%	16%	20%
Total eggs/hen	36.6	38.8	40.1
Settable eggs/hen	27.4	30.3	31.5
Egg weight (g)	52.6	53.4	53.2
Specific gravity	1.0855	1.0853	1.0844

Table 3. Effects of starter crude protein on breeder hen production variables through to 33 weeks of age (Adapted from Hudson et. al., 2000).

Egg production increased with increased starter protein level, with total egg and settable egg production to 31 weeks the greatest in the 20% protein group.

Egg weight and specific gravity was similar across all treatments (Table 3). Promoting optimal growth during the first few weeks of a chick's life appeared to positively influence hen performance.

In other studies conducted at Auburn University, early crude protein intake benefits were assessed by measuring egg production through 65 weeks of age. Similar body composition trends were noted as in the first experiment.

Pullets fed higher crude protein levels early came into production earlier and maintained a higher level of egg production. A relatively small increase in total protein intake will positively influence egg production.

ME requirements

The actual ME requirements for meat type breeders have not been well defined, and recommendations vary from 420-460 kcal per bird per day.

Moreover, most research concerning ME requirements has been done in commercial layers and the information extrapolated to broiler breeders despite the differences in size and physiological needs.

Generally, broiler breeder hens are fed according to productive stage reducing feed allowance shortly after peak egg production. Nevertheless, other factors such as environmental temperature, body weight, and weight gain must be taken into consideration.

The broiler breeder energy requirements are dependent on numerous factors but can be summarised as energy needed for maintenance, tissue gain, egg production and management.

The maintenance component contains the greatest variability and encompasses factors such as effective temperature, immune status and light period.

All components are interactive and can be quantified to allow managerial decisions to enhance efficiency of production.

Tissue gain and egg production are attained only after maintenance components are satisfied.

Any increase in bird maintenance need will divert energy away from growth and egg production unless an increase in feed energy takes place.

Managerial decisions

Relative to production, managerial decisions can have a positive or negative influence on breeder hen energy requirements.

Managerial decisions related to house design, ventilation, stocking density and lighting are among the many variables influencing maintenance. Various stresses have the potential to adversely reduce performance.

Among variables included are ambient temperature and relative humidity extremes, immunological response, atmospheric contaminants (ammonia, dust, brooder gases) and stress.

Recommendations should also be directed towards not only early protein intake but establishing relationships between optimal body composition, body weight programs and subsequent breeder performance.

University studies have been conducted and are corroborated by field data in that there appears to be critical periods during pullet rearing where growth rate needs to be enhanced.

These observations indicated that the shape of the pullet body weight curve has an effect on hen performance. Rearing recommendations will be modified in the future as a greater understanding of the bird's requirements is reached.

Conclusion

Rearing broiler breeders for optimum chick production and quality can be a complex enterprise. As broiler breeder nutrition and feeding guidelines are established they must be constantly updated as the genetic packages and management styles change.

Nutrient intake during the replacement phase can and does influence a number of important factors involved in lay.

However, final chick numbers are so far removed from the rearing program that correlations between them are difficult.

Research must be conducted in such a way that bird requirements are identified and modelled. ■

References are available from the author on request