

# Nutrition is key in broiler performance

**To maintain the high performance of their animals, poultry producers have to take a good look at what they are feeding their birds. In this article, we take a look at several critical parameters in formulating broiler feed to maintain healthy poultry performance.**

By Dr K.R. Gunasekar, *technical manager, Avitech Animal Health Pvt. Ltd.*

**F**ormulating feed requires in-depth knowledge of several parameters, such as the energy and amino acid profile in the feed. The performance and profitability of the business could be negatively influenced if these parameters are not properly taken into account. Other factors that influence poultry performance are environmental challenges (climate), disease outbreaks and the genetic capacity of the birds.

## Nutritive value of raw materials

Raw materials are purchased based on price, availability and nutritional value. The nutritional value is different in every harvest, source and batch. It is therefore important to assess the nutritional value each time to ensure that the feed is of a desired quality. Upon purchase, raw materials need to be analysed for quality parameters after collecting a representative sample (Table 1).



**Table 1 - Nutritional standards for broilers, 2005 (Avitech)**

Parameters	Prestarter	Starter	Finisher
Crude Protein %	23.00	22.00	21.00
ME Kcal / Kg %	3000	3100	3200
Dig Lysine %	1.21	1.12	1.01
Dig Methionine %	0.54	0.50	0.45
Dig M+C %	0.88	0.81	0.76
Dig Arginine %	1.25	1.16	1.07
Dig Threonine %	0.80	0.74	0.68
Dig Tryptophan %	0.19	0.18	0.16
Calcium %	0.90	0.85	0.80
Available phosphorus %	0.50	0.48	0.46
Sodium (min) %	0.16	0.16	0.16
Potassium (min) %	0.55	0.55	0.55
Chloride (max) %	0.30	0.30	0.30
Na+K-Cl mEq	250	250	250

## Amino acids and energy

Because raw materials vary in digestibility, it is necessary to consider digestible amino acids (Table 2) while formulating the feed.

A relationship exists between the energy and the digestible amino acids, which if maintained, will enable adjustment of crude protein levels in the diet. This will reduce the feed cost without compromising performance. Optimum live performance, maximum protein retention and reduced carcass fat content can only be obtained if a proper ratio between energy and digestible amino acids is maintained (Table 3). However, these ratios vary between different growing periods (starter, grower and finisher). Nutritionists

work with different energy levels ranging from 2,800 to 3,300 kcal / kg of feed when formulating broiler feeds. To achieve a good amino acid profile, the other critical amino acids need to be balanced with reference to lysine (Table 4).

## Fatty acids

The essential fatty acids for poultry are Linoleic acid and Linolenic acid. Together with other non-essential fatty acids they make up the fatty acid profile of the diet. An ideal fatty acid profile should be maintained in the diet to improve the keeping quality and meat quality. As a general guideline, the ratio between unsaturated and saturated fatty acids should be 'more than one'. Some fats and their fatty acid composition are

**Table 2 - Digestibility coefficient (%) of amino acids for selected raw materials**

Lysine	Methionine	Cystine	Arginine	Threonine	Tryptopan
Maize	81	91	85	89	84
Jowar	95	88	90	84	94
Broken Rice	67	81	90	83	65
Bajra	90	90	90	91	94
Rice Polish	75	78	68	87	70
DORB	77	77	90	88	65
SFDOC	77	94	78	96	76
SOYA	88	94	82	92	87
FM	88	92	73	92	89
RSM	68	86	90	89	90
Oil Fish	88	92	73	92	89
MBM	79	85	58	85	79
MGM	88	97	86	96	92
FF SOYA	90	90	82	91	82

Note: DORB: de-oiled rice bran, SFDOC: sunflower de-oiled cake, FM: fishmeal, RSM: rapeseed meal, MBM: meat cum bone meal, MGM: maize gluten meal, FF soya: full fat soya

**Table 5 - Fatty acid profile of different fats (as percentage of total fats)**

Fats	Palmitic	Palmitoleic	Stearic	Oleic	Linoleic	Linolenic
Palm oil	45.1	0.1	4.7	38.8	9.4	0.3
Rice bran oil	16.4	0.3	2.4	43.8	34	1.4
Mustard oil	2.8	0.2	1.3	23.8	14.6	7.3
Soya bean oil	11	0.1	4	23.4	53.2	7.8
Sunflower oil	6.8	0.1	8.7	18.6	63.2	0.5
Tallow	25.5	3.4	21.6	38.7	2.2	0.6
LARD - Pig fat	24.8	3.4	12.3	45.1	9.9	0.1

given in Table 5. The energy content of different fat sources is shown in Table 6.

### Calcium requirement of birds

Besides energy, birds adjust their feed intake based on their calcium requirement. The rapid growth of broilers requires large quantities of feed to be consumed and hence feed manufacturers maintain the calcium at a marginal level. Raw materials are a source of calcium. However, the calcium content of raw materials varies widely. Excess calcium will bind to phosphorus and make it unavailable to birds. This is a costly input to the feed manufacturers. The majority of the feed additives used in poultry feed are based on a calcium carbonate carrier, which also contributes a significant amount of calcium to the diet.

### Electrolyte balancing

Electrolyte balance is represented by the Na+K-Cl balance in the diet. Electrolyte balance is expressed in terms of mEq. The mEq is an electrolyte that can be obtained by dividing its molecular weight by 1,000. Apart from salts (Sodium Chloride, Sodium Bi-carbonate, Potassium Chloride etc.), electrolytes (Sodium, Potassium and Chloride) are also derived from feed raw materials. Electrolytes are further derived from feed additives like Chloride from Lysine Hydrochloride, Choline Chloride etc. An

**Table 3 - Amino acid to energy ratio (% of lysine / 1000 Kcal energy) in different age of broilers**

Attributes	Starter	Grower	Finisher
Digestible Lysine %	1.21	1.12	1.04
Energy (Kcal / kg of feed)	3000	3100	3200
Ratio (% of lysine / 1000kcal energy)	0.404	0.361	0.325

**Table 6 - Energy provided by different sources of fat**

Fats	ME Kcal / kg	Ether Extract
Palm oil	8,300	100
Rice bran oil	8,500	100
Mustard oil	8,500	100
Soya bean oil	8,800	100
Sunflower oil	8,800	100
Tallow	7,100 - 8,500	100
LARD - Pig fat	7,100 - 8,000	100

assessment and adjustment in the electrolytes balance is important whilst formulating feeds. Electrolyte balance (Na+K-Cl) of poultry feed should be maintained between 200 - 250 mEq per kg of feed.

### Immuno-modulation

To maintain poultry performance, improving the immune status of the bird through nutrition is an important item. A number of dietary components can have direct and/or indirect implications on the intensity and efficiency of the immune responses. Some are capable of increasing the immune responses while others are detrimental to it. There is no doubt that broilers on well-balanced diets are immunologically competent and able to cope better with disease challenges. It is imperative that most nutrients necessary for optimal growth (energy, amino acids, etc.) are also necessary for optimal immunocompetence. The following factors have to be looked into for improving immunity through nutrition:

- A well-balanced feed with adequate energy and amino acid profile.
- Proper dietary arginine concentration
- Proper sodium and chloride levels
- Levels of vitamin A, E and C
- Optimum Methionine level
- Adequate Zinc, Manganese and Copper level
- Various natural and synthetic additives are available to improve immunity.

### Summer management

Feed formulation requires significant adjustment during the summer season. The reduction in feed intake, and thus

**Table 4 - Ideal amino acid ratio (% of digestible lysine)**

Digestible Amino acids	Prestarter /Starter	Finisher
Methionine	45	44
Met+Cys	73	75
Arginine	104	106
Threonine	66	67
Tryptophan	16	16

reduction in specific dynamic heat of metabolism, improves the tolerance of birds towards hot weather. Moreover, changes in the macro and micro formulation increase the

passage time of nutrients in the intestine. Increase in the energy content of the feed is required to take care of the reduction in the feed intake during hot periods. The increase in energy is best achieved by adding fat (oil) that stimulates feed intake and further improves the palatability of feed. Fat also reduces the rate of passage of ingesta within the digestive system. (At the same time we need to reduce daily intake of energy by the bird). Minimising excess amino acids also improves feed intake.

Furthermore, the feed electrolyte balance should be maintained more than 250 mEq, especially in the summer. (The bicarbonate ions coming from sodium bicarbonate should also be considered while balancing). Usage of Vitamin C (coated) at a minimum dose of 100g/mt of feed is advisable together with the use of chelated trace minerals. An increase in the fibre content of the feed is useful in slowing down the intestinal motility (normally higher in the summer). Including at least 2-3% SFDOC to increase the fibre in all types of feed will deliver better results. (This will contribute at least 0.3 - 0.4% increases in the fibre of the diet). The addition of Phytase (80 - 200 g/tonne) depending on the feed formula is useful in reducing stress to the birds.

### Micro nutrient optimisation

Various additives/supplements are used in poultry feed to balance the deficiency of vitamins and trace minerals or to combat diseases. The ideal combination of micro ingredients will depend on the type of raw materials used in the feed, environmental challenges and the growth pressure. Optimising the micro ingredient formulation with the right level of additives is important in maximising the genetic potential of the bird. ■