

Betaine for increased breast meat yield

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In North America and Europe breast meat is a favoured cut for consumers and is therefore of significant economic value for the poultry sector. Modern poultry strains have been selected for increased carcass yield, particularly with respect to the breast muscle.

To gain full advantage of this genetic improvement, poultry nutritionists formulate diets designed to provide the birds with a good nutrient profile as well as nutrient digestibility.

Historically nutrients such as crude protein, essential amino acids as well as the amino acid to energy ratio are known to affect the ability of the bird to accrete carcass protein. More recently, betaine has been shown to have a similar effect.

Natural betaine

Betafin from Finnfeeds is natural betaine that has been extracted from sugar beet and subsequently purified. Betaine functions in the body as an osmolyte to help defend against dehydration, it is also a methyl group donor which supports synthesis of many components such as protein, DNA/RNA and the neurotransmitter epinephrine.

Betafin has been shown to reduce lesion scores, increase nutrient digestibility and intestinal tensile strength in chickens with coccidia-challenge history. Betafin also allows the commercial broiler producer to economically optimise usage of methionine and choline through the methyl donor function of Betafin.

Water is frequently overlooked as a nutrient vital for the growth of farm animals, even though it is a large component of the meat product ultimately sold to the consumer.

Muscle from market age turkeys and

	Age (weeks)	Treatment	Live weight at slaughter (kg)	Carcass weight (kg)	Breast (% of carcass)	Breast yield improvement (%)
Trial 1	22	Control	17.04	14.04	32.67	
		Betafin	16.92	14.41	33.92	3.83
Trial 2	20	High energy	18.29	14.59	31.92	
		Low energy	18.39	14.53	32.40	
		Low energy + Betafin	18.36	14.53	32.87	2.98
Trial 3	20	Control	19.86	15.61	32.71	
		Betafin	19.90	15.67	33.60	2.72
Average		Control	18.40	14.69	32.43	
		Betafin	18.39	14.87	33.46	3.33

Table 1, Weight and breast meat yield of tom turkeys supplemented with 0 or 0.1% of Betafin. Trial 1 was supplemented from 1 day of age to 22 weeks of age. Trials 2 and 3 were supplemented from 5 to 20 weeks of age. The use of Betafin statistically significantly improved breast meat yield at $P < 0.05$.

broilers is approximately 74% to 75% water (USDA Nutrient Database for Standard Reference, 1999).

Water has a very basic function in cells of all types in addition to it being the matrix that bathes and supports the cell's organelles.

It is the key nutrient regulating cell metabolism, so a slight increase in water content of a cell increases that cell's growth related activity while loss of water from the cell decreases growth.

In addition, a large portion of energy within the body is used to keep a relatively constant water volume within cells.

Estimates of 30 to 60% of the maintenance energy used within the

visceral organs are associated with the sodium-potassium ATPase pump. This pump helps maintain water balance in cells and is particularly important in the absence of osmolytes such as betaine.

Less energy required

The advantage of the osmolyte betaine versus the sodium-potassium ATPase pump is that less energy is needed to accumulate betaine within a cell.

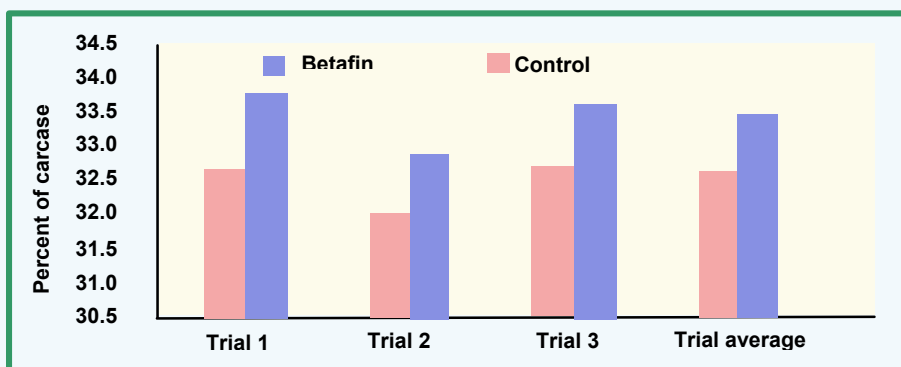
In addition, the osmolyte betaine is safe for the cell to accumulate to high levels whereas high levels of electrolytes can adversely affect cell metabolic activity.

Specifically, Betafin has been shown to alleviate dehydration of cells during osmotic stress and is accumulated by aquatic species during osmotic stress for the same purpose.

In broilers, Betafin has been shown to increase body water retention during heat stress, a factor important in the ultimate survival of the bird during heat stress, and to help improve performance of broilers given a coccidia challenge.

In trials conducted in the USA, Mexico and Canada a 2% average improvement in breast meat yield in broilers fed diets supplemented with Betafin was observed. Recent research conducted in the USA showed that Betafin increased turkey breast meat yield in market age toms by an average of 3% (see Table 1).

Fig. 1. Betafin improves breast meat yield in market age turkey toms.



The diets fed consisted of corn, soybean meal, canola meal and meat meal or meat byproduct meal as the primary ingredients.

Amino acid supplementation was according to commercial practice in the USA. Trial 1 was conducted in conjunction with a US turkey producer while trials 2 and 3 were conducted in University facilities.

Betafin BCR (97% betaine) was used in trial 1, while Betafin S6 (91% betaine) was used in trials 2 and 3. In all the trials 0.1 % Betafin was added to the diets.

Promoting breast meat yield

Established effects of betaine supplementation include better absorption of protein, lysine and methionine in stressed birds as well as the formation of methionine from amino acid homocysteine in the liver.

Significant increases in blood methionine, serine and glycine have also been noted in goats fed diets containing betaine. In non-stressed pigs fed a diet containing betaine,

serum levels of serine and valine increase significantly while methionine and glycine tend to increase.

Plasma homocysteine level decreases in birds fed an adequate diet supplemented with betaine; this would be expected if betaine is being used as a methyl group source by the liver to convert homocysteine into methionine. Thus, betaine may affect the blood amino acid profile through its osmolyte activity in helping alleviate dehydrating stresses in the intestine as well as through its methyl donor role.

However, given the metabolic effects of osmolytes on cells, it is possible that betaine may affect the muscle cell itself. All body tissues can use betaine for its osmolyte activity, although only the liver can also use betaine as a methyl group source in many species.

In farm animals, the intestine, liver and kidney will accumulate betaine, although relatively high levels of dietary supplementation of betaine are needed for betaine to be detected in tissues other than the intestine, liver and kidney.

Specifically, low levels of betaine can be detected in the muscle when broilers have been supplemented at a level of approximately 800ppm betaine in their feed. The level associated with breast yield improvement is 1000ppm.

This suggests that part of the yield response may be related to the muscle itself.

Given the known effect of osmolytes on improving growth functions of the cell, it is possible that a portion of the yield effect may be related to a more growth related mode in the muscle cell.

However, it is important to note that the rate of muscle accretion is dependent on the profile of nutrients available to the muscle.

Thus, intestinal and liver effects of betaine are also likely contributors to the yield effect noted in birds fed diets supplemented with Betafin. †

KEY WORDS

Betafin (poultry), Betafin, betaine, turkey, breast yield, breast meat, osmolyte

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