Betafin® natural betaine

TECHNICAL REPORT

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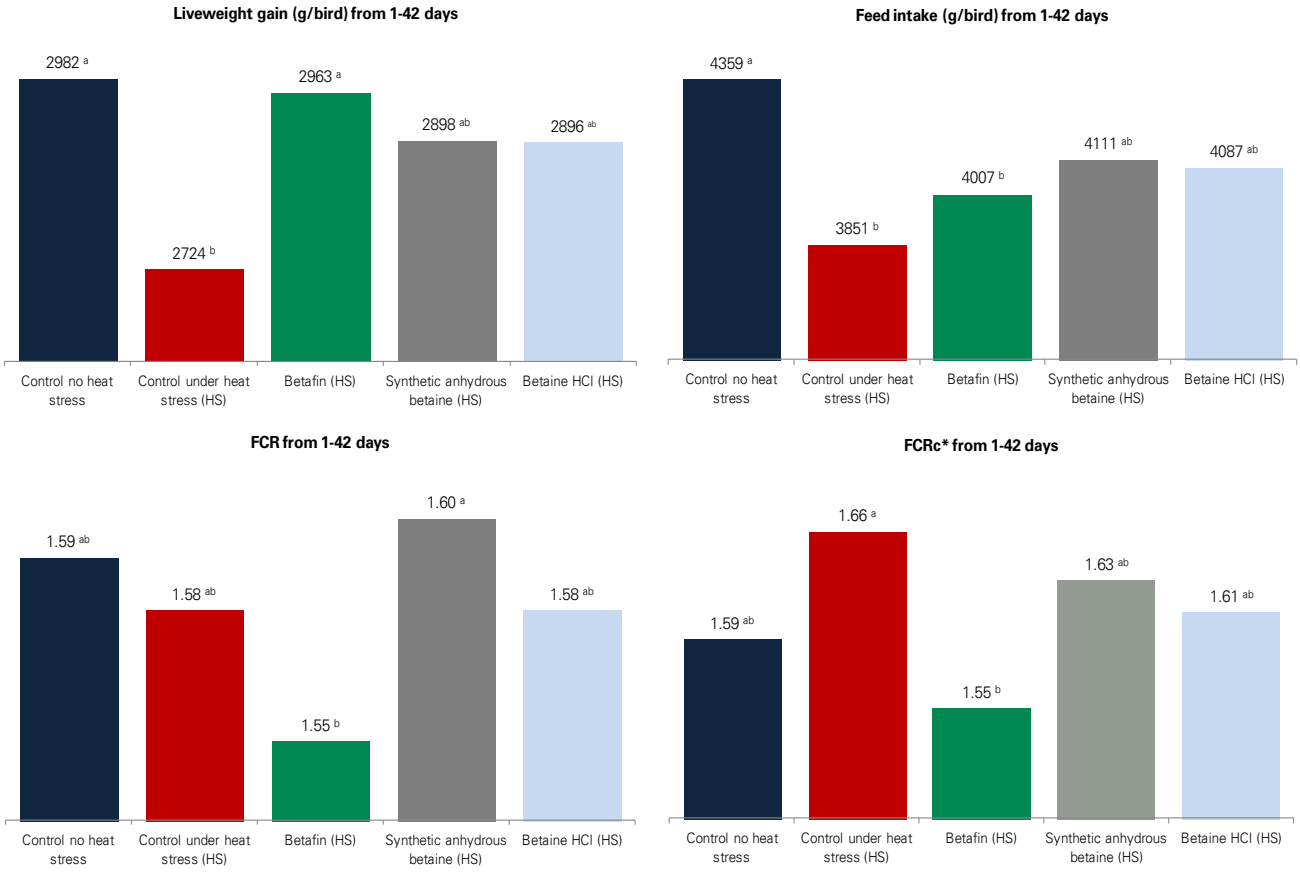
Betafin® S1 natural betaine gives superior performance compared to synthetic anhydrous betaine and betaine HCl products of broilers in a heat stress model

Trial site: Massey University, New Zealand

Natural betaine has two roles in nutrition. As an osmoregulator it can protect cell enzyme systems and membranes from ionic inactivation during stress[1,2,4,5]. As a methyl donor via transmethylation, it is more effective than other potential methyl group donors such as methionine and choline [1,2,4,8]. Natural betaine benefits parameters such as bodyweight gain[1,2,8], feed utilisation and costs [1,2,8,9], carcass lean deposition [1,2,11] and litter size [10,12], with effects magnified at times of production stress (e.g. heat stress, coccidiosis challenge) [3,4,6,7].

- Previous research[(1,2,3)] has shown that betaine can help in alleviating the negative effects of heat stress on growth performance in domestic animals due to its osmolytic properties
- Betafin® S1 natural betaine supplementation significantly improved (P<0.05) liveweight gain of broilers in a heat stress model by 8.8%, in comparison to synthetic anhydrous betaine and betaine HCl products which only numerically improved liveweight by 6.4% and 6.3% respectively.
- Betafin® S1 natural betaine supplementation significantly improved (P<0.05) FCRc of broilers in a heat stress model by 11 points (6.6%), in comparison to synthetic anhydrous betaine and betaine HCl products which only numerically improved FCRc by 3 points (1.8%) and 5 points (3.0%) respectively.

Results: Performance summary from 1-42 days of age. Heat stress from day 28 onwards



[ab] Means not sharing the same superscript differ significantly (P<0.05).
*FCRc 3 points per 100g bodyweight difference versus the positive control.

Betafin® S1 natural betaine and synthetic anhydrous betaine both contained 96% betaine, and Betaine HCl contained 71% betaine. All products were added to supply 1.2 kg betaine/tonne of feed.

Results: Liveweight gain, feed intake and feed conversion (1-21 days and 21-42 days)

	Control no heat stress	Control under heat stress (HS)	Betafin® S1 natural betaine[1] (HS)	Synthetic anhydrous betaine[1] (HS)	Betaine HCl[1] (HS)
1-21 days					
Liveweight gain (g)[2]	787 [b]	808 [ab]	837 [a]	811 [ab]	832 [a]
Feed intake (g)	1043	1075	1083	1077	1080
FCR	1.34 [a]	1.34 [a]	1.29 [c]	1.33 [ab]	1.30 [bc]
21-42 days					
Liveweight gain (g)[2]	2194 [a]	1916 [b]	2126 [a]	2087 [ab]	2064 [ab]
Feed intake (g)	3316 [a]	2776 [b]	2924 [b]	3033 [ab]	3007 [ab]
FCR	1.71	1.77	1.72	1.77	1.77
1-42 days					
Mortality (%)	7.5[b]	35[a]	30[a]	29[a]	30[a]
Carcass characteristics					
Carcass weight, % of bodyweight	73.3[b]	72.2[c]	73.8[ab]	74.6[a]	73.7[a]
Breast, % of bodyweight	20.5[a]	19.3[b]	21.5[a]	21.1[a]	20.6[a]
Abdominal fat pad, % of bodyweight	1.39[b]	1.78[a]	1.29[b]	1.37[b]	1.43[b]
Relative cost per kg liveweight gain[3] versus the heat stress control (%)	-	100	95	99	98

[a-c] values in the same row with no common superscript differ significantly at P<0.05.
[1]to supply 1.2kg betaine per tonne of feed.
[2]Measured as the average liveweight of the birds on the final day of the period minus the average liveweight on the start of that period.
[3]Cost per kg gain = average diet cost (including the relevant betaine source) per kg x FCRc for that treatment.

Diets: (kg/t) as fed

Ingredients	Starter (1–21 days)	Grower-finisher (21–42 days)
Corn	558	568
Corn DDGS	60	150
Soybean meal, 48% CP	335	216
Soy oil	12.4	33.6
L-Lysine. HCl	2.9	3.8
DL-Methionine	2.7	2.4
L-Threonine	0.6	0.8
Salt	2.8	2.1
Limestone	11.0	10.7
Dicalcium Phosphate	10.0	7.7
Vitamin/trace mineral premix	3.3	3.2
Fine sand	0/1.25	0/1.25
Betafin® S1 natural betaine[1](96% betaine)	0/1.25	0/1.25
Synthetic anhydrous betaine[1](96% betaine)	0/1.25	0/1.25
Betaine HCl[1](71% betaine)	0/1.70	0/1.70
Phyzyme XP (500 FTU/kg)	+	+
Nutrient		
Crude protein %	22.7	19.5
ME kcal/kg (*MJ/kg*)	2950 (*12.35*)	3100 (*12.97*)
Lysine %	1.40	1.18
Digestible lysine %	1.20	1.00
Methionine %	0.61	0.55
Digestible methionine %	0.57	0.50
Methionine + cysteine %	0.99	0.88
Digestible methionine + cysteine %	0.86	0.76

[1]to supply 1.2kg betaine per tonne of feed.

Design:

400 male broiler chicks (Ross 308, initial bodyweight approximately 40g) were allocated to 5 treatments with 8 cages per treatment (10 birds/cage). During the first 28 d, the temperature regime was as per normal husbandry procedures (at 31°C for the first week and then was gradually reduced to 22°C at 21 days of age). From 28 to 42 d, one treatment continued on normal regime (thermoneutral conditions). Birds in the other treatments were designed to be exposed to heat stress of 35°C for 6-8 hours a day, but this had to be modified because of high mortality on the first day of exposure. Heat stress therefore continued at 28°C for the duration of the trial from this point (day 29). All diets were based on corn/soy and were fed over two growing periods: starter (1-21 days) and grower-finisher (21-42 days). Two control treatments were used, one kept under normal husbandry procedures (thermoneutral conditions) and one exposed to heat stress from day 28, as previously described. These two control treatments received the standard diets. The other three treatments were exposed to heat stress and each diet supplemented with one of the three betaine sources (Betafin® S1 natural betaine 96% betaine; synthetic anhydrous betaine, 96% betaine or betaine HCl, 71% betaine). Betaine products were added to supply 1.2kg betaine /tonne of feed. All diets were pelleted at 70°C and fed *ad libitum*. Feed and birds were weighed on days 21 and 42, and the corresponding FCR value was calculated.

Comments:

1. Note that the high mortalities (30-35%) observed in this trial under controlled heat stress conditions can be very representative of a commercial situation where ambient temperature suddenly increases during a heat wave.

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Further supporting references are available on request from Danisco Animal Nutrition

Key Words

Betafin® S1 natural betaine, broiler, betaine, poultry, corn, DDGS, soybean meal, bioefficacy, pellet, vegetable protein diet.

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