

Heat Stress in Layers: New Research

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A recently completed research project at a private facility compared the effect of added sodium from sodium bicarbonate or S-Carb®, sodium sesquicarbonate in layers. Evaluation of egg production, egg quality and layer performance were compared in two genetic strains and at three temperature levels. The temperatures were controlled in environmental rooms to be normal (21.1-26.7° C), warm (23.9-35° C), and hot (26.7-37.2° C). Layers were fed for 24 weeks, from 18 to 42 of lay.

All of the diets were corn / soybean based. The analysis of the diets is shown in table 1. Values shown for sodium and chloride are from laboratory analysis, and potassium reflects the predicted value. Test diets were balanced for 50 meq additional sodium from either sodium bicarbonate or S-Carb and 100 meq from S-Carb. Due to the different sodium content of S-Carb vs. sodium bicarbonate, 30.4% vs. 27%, less S-Carb was required to meet the same sodium level.

Table { SEQ Table * ARABIC }: Dietary Electrolyte Balance

	Control	50 meq Bicarb	50 meq S-Carb	100 meq S-Carb
DEB meq/kg	176	219	232	275
Sodium (%)	0.17 %	0.19 %	0.20 %	0.30 %
Potassium (%)	0.71 %	0.71 %	0.71 %	0.71 %
Chloride (%)	0.28 %	0.16 %	0.13 %	0.13 %
Added bicarb or S-Carb source %	0	0.41 %	0.36 %	0.72 %

There were no significant interactions on the variables shown in table 2 and temperature. Hens fed higher electrolyte diets produced slightly fewer eggs than the control hens. These treatments also had slightly higher mortality rates. There may have been some impact of the very low chloride levels in the S-Carb treatments. The NRC recommends a minimum of 0.15% chloride, and these diets are below that threshold.

The percent breakage of the eggs was reduced with added sodium bicarbonate or S-Carb. This is also confirmed with the specific gravity analysis. The addition of sodium bicarbonate improved specific gravity indicating thicker egg shells. S-Carb also improved specific gravity slightly more than the sodium bicarbonate at equal sodium levels, and even more at the high addition. Intake in the 100 meq S-Carb treatment was significantly higher than other treatments.

Table { SEQ Table * ARABIC }: Diet Changes and Performance:

	Control	50 meq Bicarb	50 meq S-Carb	100 meq S-Carb
% Hen day production	76.70 _a	74.49 _{ab}	75.18 _a	72.25 _b
% breakage	0.45 _a	0.31 _a	0.34 _a	0.35 _a
Intake	19.11 _b	18.85 _b	18.87 _b	19.68 _a
Egg Wt (gm)	52.11 _a	50.79 _b	51.24 _b	50.70 _b
Specific Gravity	1.0752 _b	1.0768 _a	1.0770 _a	1.0773 _a

The only significant interaction of temperature and egg shell quality was in the percent breakage. As expected, hot temperatures increased breakage in the control hens. The addition of bicarbonate or S-Carb at the 50 meq level appeared to improve egg shell strength and reduced breakage.

Table { SEQ Table * ARABIC }: Effect of Temperature on Percent Breakage:

	Control	50 meq Bicarb	50 meq S-Carb	100 meq S-Carb
Normal	0.378 _{ab}	0.053 _b	0.450 _{ab}	0.481 _{ab}
Warm	0.372 _{ab}	0.581 _{ab}	0.274 _b	0.181 _b
Hot	0.603 _a	0.298 _{ab}	0.292 _{ab}	0.392 _{ab}

There was a significant interaction between diet and genetic strain as shown in table 4. The addition of either sodium product reduced breakage in the Hyline W36 hens, but not in the Babcock hens. It should be noted that the breakage in the Babcock hens was lower in the control birds, than the Hyline hens.

Table { SEQ Table * ARABIC }: Interaction of Strain / Diet on Percent Breakage:

	Control	50 meq Bicarb	50 meq S-Carb	100 meq S-Carb
Hyline W36	0.683 _a	0.343 _b	0.278 _b	0.482 _{ab}
Babcock B300	0.219 _b	0.279 _b	0.399 _{ab}	0.221 _b

Research results showing improved egg shell quality has been very consistent when midnight feeding is used, as well as in commercial situations during times of severe, prolonged heat stress. The addition of sodium bicarbonate or S-Carb to layer diets during times of heat stress is becoming more common in commercial situations. The results of this study confirm observations from field usage that either S-Carb or sodium bicarbonate will improve egg shell quality when fed at an equal sodium level. There were no differences in the effect of S-Carb or sodium bicarbonate. Both sodium sources decreased the incidence of egg breakage in the hot environment where shell quality problems are the greatest concern.

FMC Corporation
Animal Nutrition
3415 Hwy 95
Parma, Idaho 83660



Advantages of S-Carb over sodium bicarbonate in layer diets are in lower required inclusion rates, ease of handling, and purity. Recommendation for feeding S-Carb for heat stress include balancing the diet to an Electrolyte Balance of 225-250 meq/kg, with care to insure that minimum chloride levels are maintained.