Efficacy of double-buffered sodium butyrate supplementation on broiler performance, footpad dermatitis and intestinal histomorphology

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Preliminary Considerations

Butyric acid is a short chain fatty acid (SCFA).
It is corrosive and volatile in nature;
therefore, the sodium salt of butyric acid is used
which allows easy handling, stability and is less odorous (Ahsan y col., 2016).

Typical gross energy values		
SCFA	Gross Energy (McDonald & col., 2022)	Gross Energy (FEDNA-Spain, 2024)
	MJ/kg DM	Kcal/kg
Acetic Ac.	14.6	3,490
Propionic Ac.	20.8	4,970
Butyric Ac.	24.9	5,975

Preliminary Considerations

Tables FEDNA 2019 - Spain	DE_PIG	ME_PIG	NE_PIG	NE SOWS	AME CHICKS	AME POULTRY	DE RABBIT
	Kcal/kg	Kcal/kg	Kcal/kg	Kcal/kg	Kcal/kg	Kcal/kg	Kcal/kg
BUTYRIC ACID	5,975	5,975	4,600	4,600	5,500	5,500	5,360

Butyrate presence in the GIT can stimulate gastric and pancreatic secretions. Therefore, nutrient digestibility and absorption could be improved (Moquet, 2018).

This can explain the improvement in digestible amino acids, digestible energy and metabolizable energy using some butyrates (Denbow, 2015; Moquet y col., 2016).

Preliminary Considerations

Studies have shown that earlier releasing of products in the small intestine can stimulate villi development and nutrient digestibility, and later releasing time in the cecum has an inhibitory effect on gut bacteria (Fernández-Rubio et at., 2009; Guilloteau et al., 2010).

Uncoated double buffered synthetic sodium butyrate (DBSB) can have an effect on the upper part of the gastrointestinal tract of the broilers and could improve feed digestibility and performance.

The objective of the present study was to evaluate the effect of dietary supplementation of DBSB on the performance, intestinal histomorphology and footpad dermatitis of broilers.

Materials and Methods

Allocation:

The research was conducted in experimental facilities (INTA-EEA Pergamino, Argentina).
In total, **324**-day-old Cobb 500 male broilers were randomly allocated in **floor pens**.

Experimental Design:

Completely randomized block design with **2 treatments (9 replications)** with the supplementation or not of 600 ppm of a **DBSB** (BUTYL*in*®54, Dietaxion SAS).

Formulated Diets:

Feeding periods were 0-7, 8-21 and 22-33 days of age.

Control and DBSB diets were formulated according to requirements used by the local industry.

Measured Traits:

Body weight and **feed intake** were recorded weekly individually and per pen, respectively. Mortality daily.

At the end of the trial all chickens from each pen were examined for **footpad dermatitis** following the classification of the Welfare Quality (W. Quality®, 2009).
One bird per pen was euthanized and used to measure duodenum & jejunum **villus height and crypt depth**.

Materials and Methods

Statistical Analysis: Parametric data were analyzed using ANOVA and non-parametric data through the Chi-square Test.

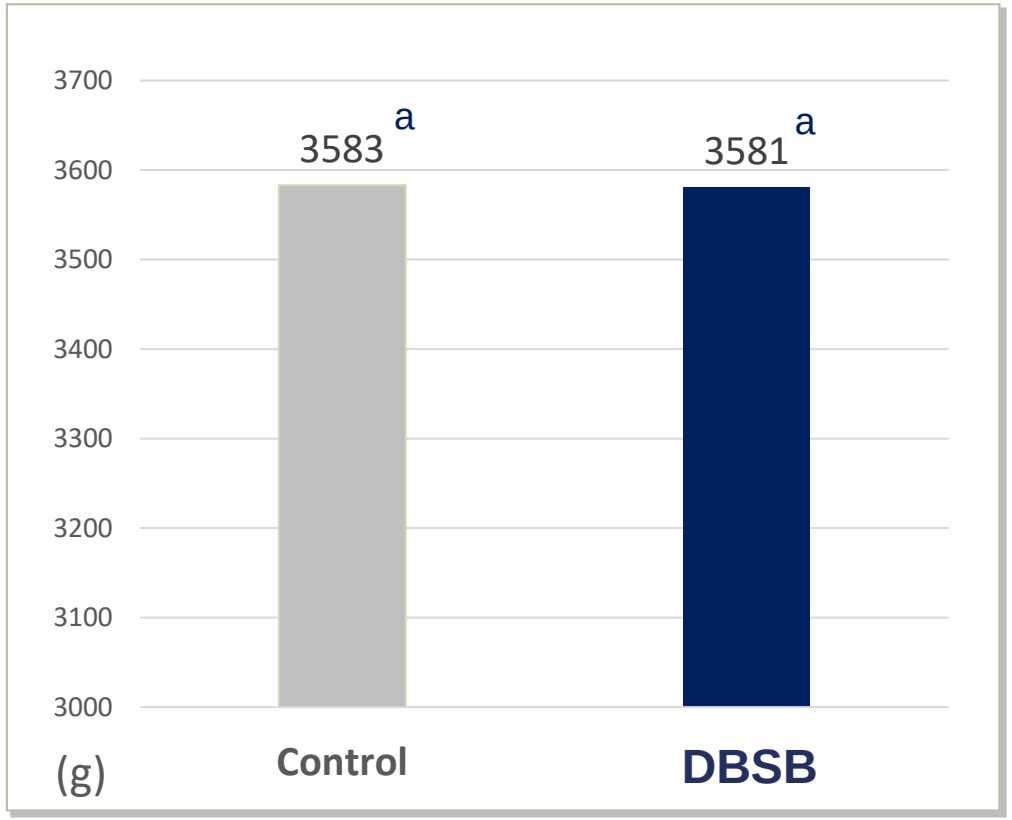
Experimental diets: Calculated nutrient and energy content

Diet	0-7 d	8-21 d	22-33 d
AME (kcal/kg)	2,985	3,088	3,140
Crude Protein (%)	22.06	20.32	18.85
Lys_{dig} (%)	1.285	1.175	1.080
$M+C_{dig}$ (%)	0.964	0.893	0.842
Thr_{dig} (%)	0.874	0.764	0.702
Ca_T (%)	0.94	0.87	0.79
P_{av} (%)	0.49	0.44	0.39

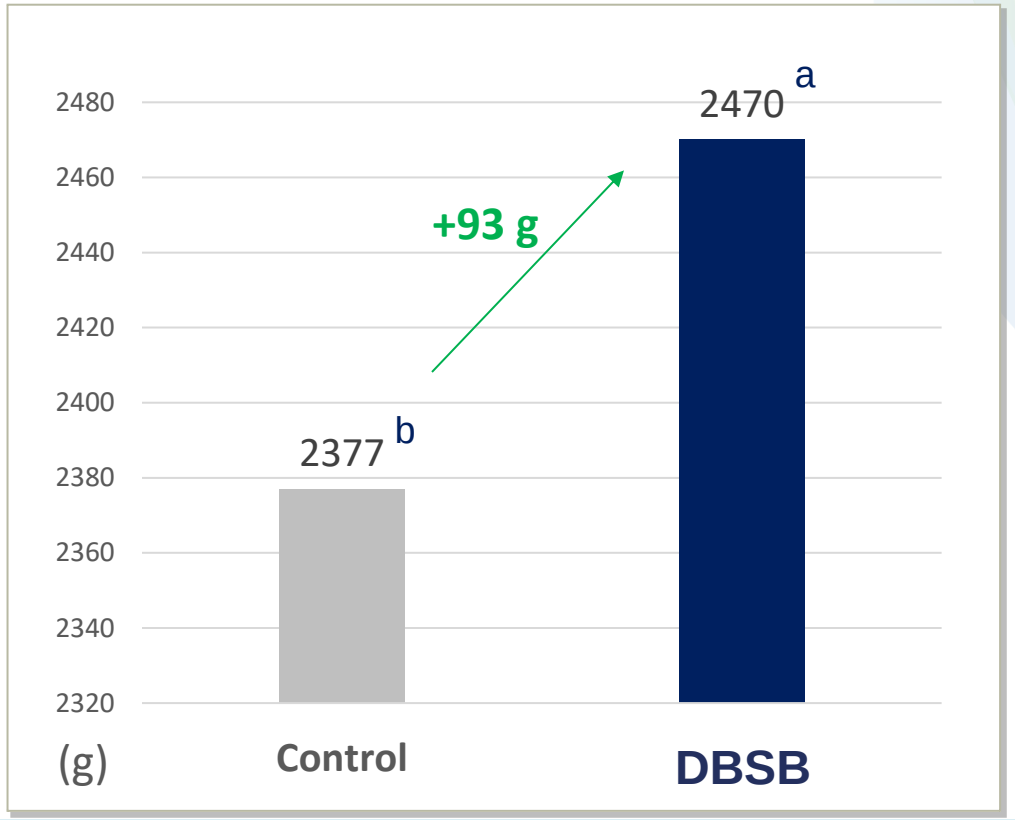
Ingredients: Corn, soy meal, soy oil, oyster shell, meat & bone meal…

Results: Performance

Feed Intake 0-33 days (g)



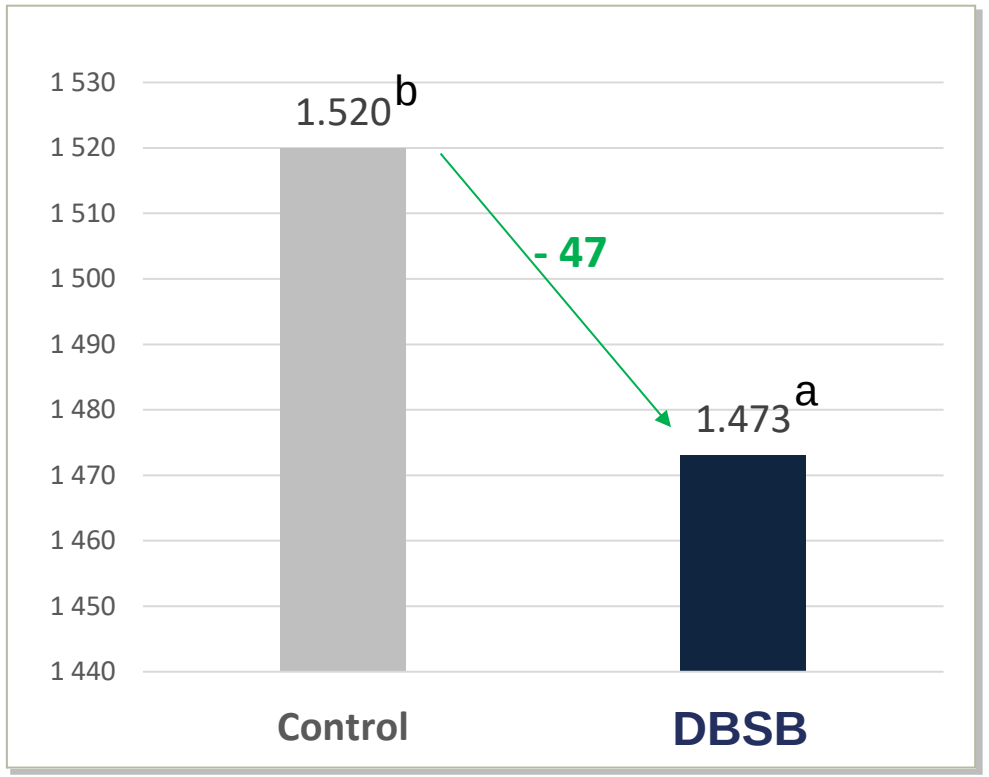
Body Weight at 33 days (g)



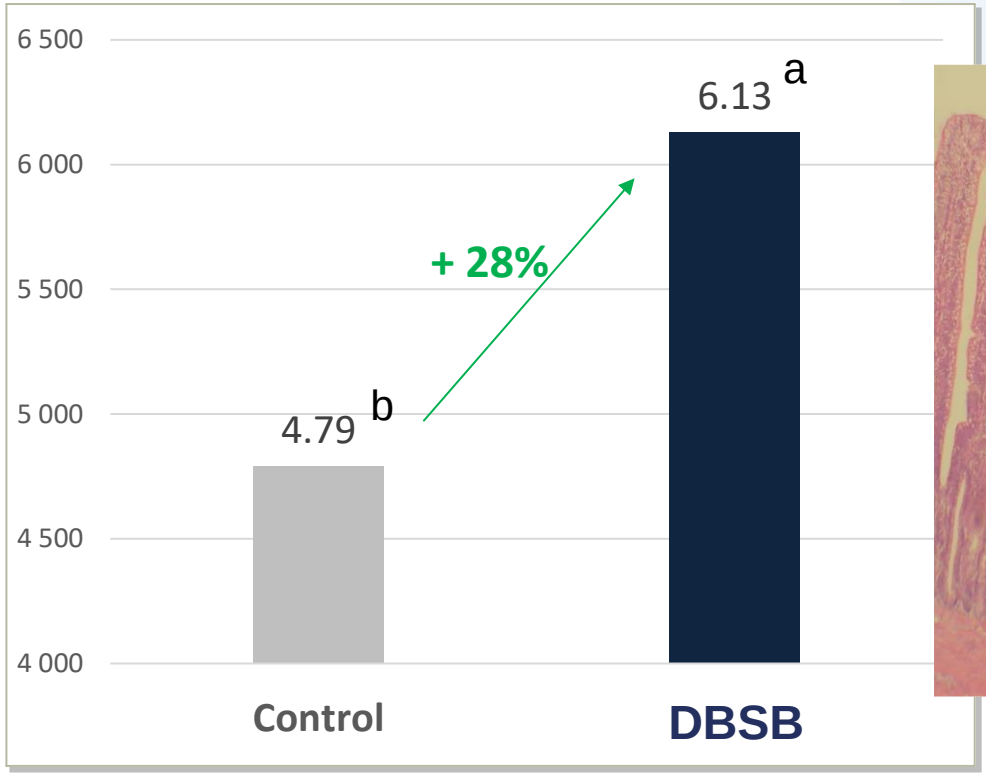
→ There were significant differences at 33d for **live weight (+3.9%) being higher adding DBSB** ($P<0.05$), but not for feed intake ($P>0.05$).

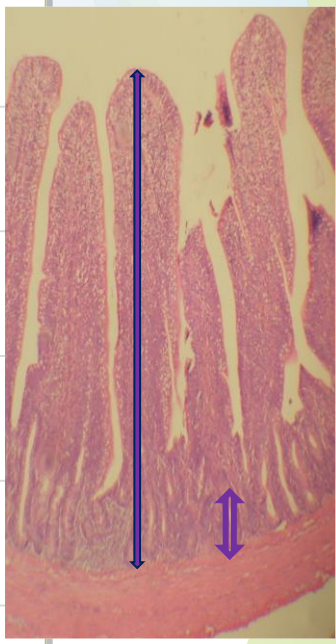
Results: Performance & Intestinal Health

Feed Conversion Ratio (0-33 days)



Jejunum Villus Height/Crypt Depth 33 d



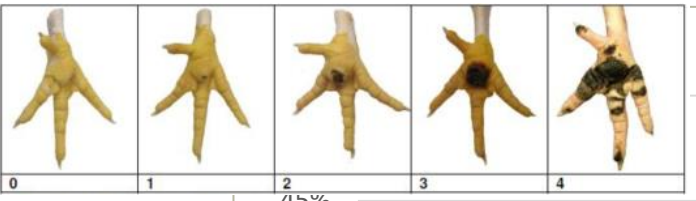


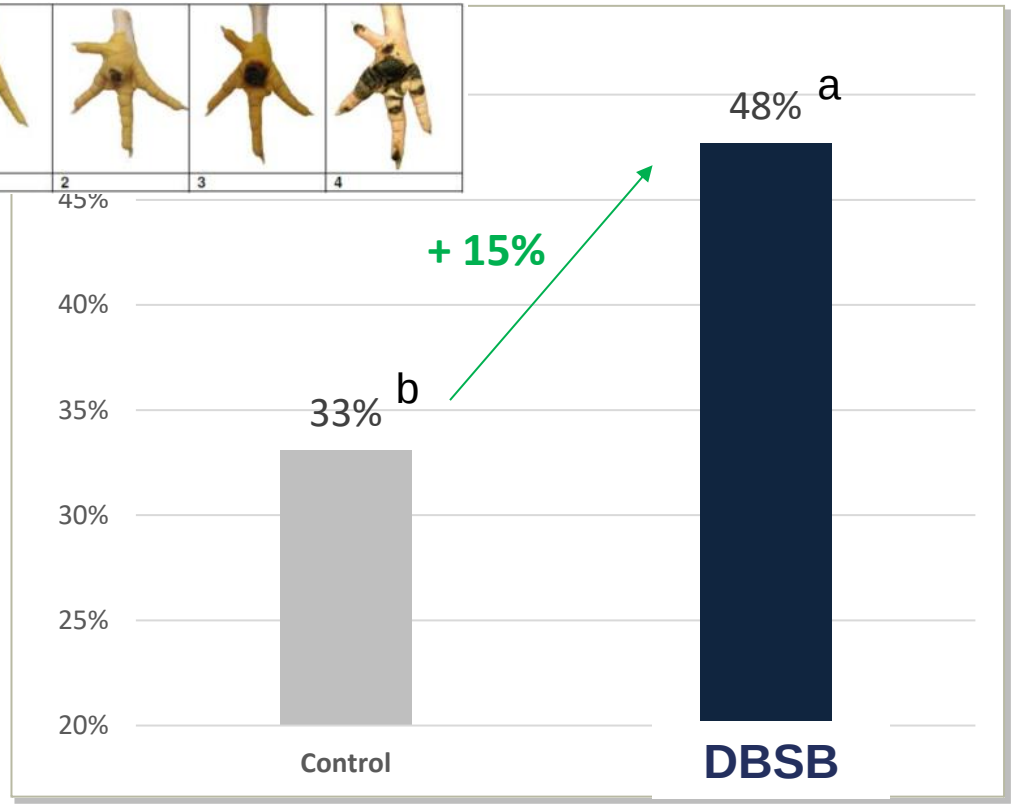
→ There were significant differences at 33d for **FCR (-3.1%, P<0.05) with better results for DBSB.**

→ Histomorphological traits VH, CD and VH/CD were not different for duodenum (P>0.05), but for **jejunum DBSB broilers obtained a higher VH/CD** and a lower CD than the CTRL ones (P<0.05).

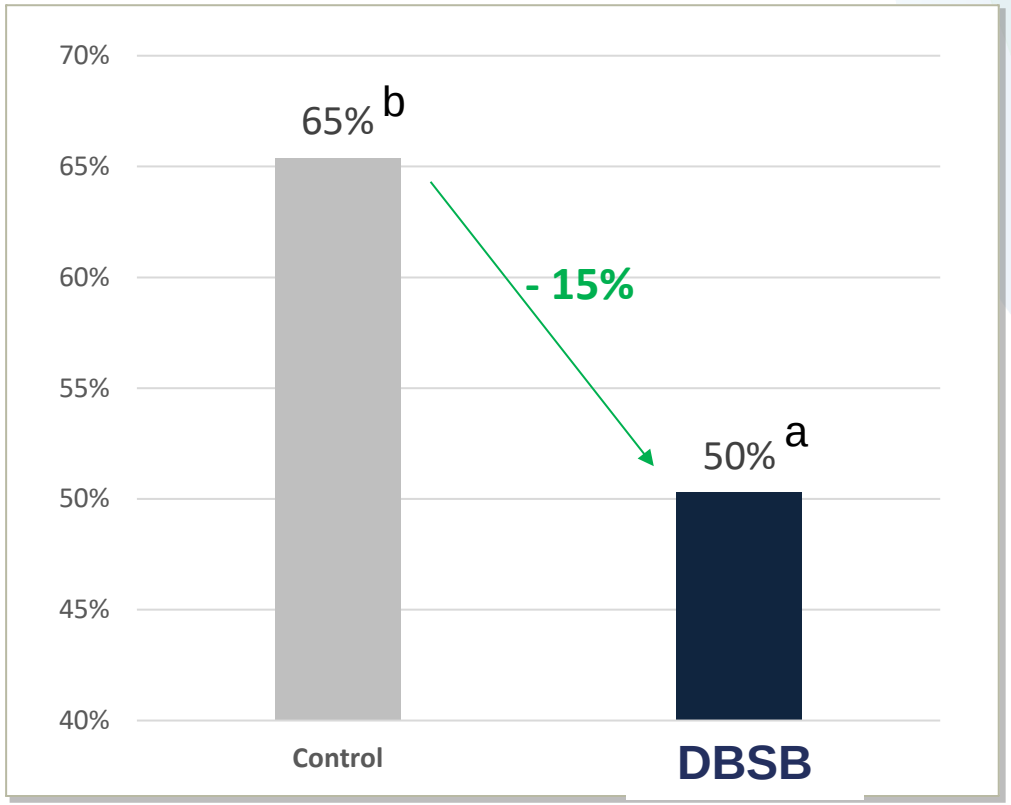
Results: Footpad Dermatitis

1 & 2 FootPad Lesion Score* (33 days)





3 & 4 FootPad Lesion Score* (33 days)



→ The addition of **DBSB** to these diets **improved footpad quality**, increasing the number of type B paws and decreasing type C paws compared to CTRL ($p \leq 0.05$).

* Type B: Minimum evidences of dermatitis (Score 1 and 2); Type C: Evidence of dermatitis (Score 3 and 4)

Conclusions

Dietary supplementation of 600 ppm of DBSB on broilers diets enables to get a better:

- FCR (- 3.1 %),
- live weight (+ 3,9 %),
- VH/CD of jejunum (+ 28 %) and
- footpad quality (+ 15 %),

which means that DBSB optimize better the feed and is then a good strategy to save resources and would avoid excess of excretions in the environment.

In a context of high prices of corn and soya, adding DBSB to broiler diets enables to make savings by formulating with lower levels of energy and protein.

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Thank you !!

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