Comparison between natural betaine (Betafin) and synthetic betaine sources.

Malcolm Mottram
Feedworks

Summary

- Natural betaine is more effective under stress conditions (heat, disease, gut health).
- Natural betaine is superior in vivo performance (ADG, FCR) producing double the performance compared with synthetic betaine sources.
- Natural betaine has a much lower carbon footprint than synthetic betaine sources (75-80% less)

Introduction

You could imagine we at Feedworks, like you, get inundated and pressured to push and sell products from current and new suppliers. One of the values we at Feedworks aspire to, and have entrenched, is to choose those products that we feel will best benefit our customers and the industry in general. Not because we are told to market or sell something. It's our choice and entails an assessment of all the data available to us in peer reviewed journals and internal or local trials to make sure the products fit contemporary diets and conditions used in our country. So why do we stick with natural betaine (Betafin) and not sell synthetic betaine? The answer lies with personal experience and supporting content/data.

Personal experience

When tight on natural Betafin supply many years ago it was suggested that synthetic anhydrous betaine would work as well as natural betaine anhydrous. So, we gave it a go with customers who had experience with Betafin for heat stress conditions (eg. Dairy cows). Almost immediately the feedback was that this source was not doing the job as well as Betafin. We had to remove the product from the market for fear of ruining the reputation of "betaine". We'd done so much research & work in pigs, poultry and especially with heat stress for cattle. It was a critical reality check that we needed. The adage once bitten twice shy permeates our organisation and this does give us the first-hand experience to share with interested parties.

However, that was not good enough for us. We knew the question would still be asked why not synthetic betaine? We wanted more evidence. We encouraged Danisco Animal Nutrition to provide new research to compare the various products in replicated in vitro and in vivo situations. This is what we will share now.

Sometimes Nature Just does it Best

Most of research in publications is done using natural betaine and specifically BETAFIN. Very little published work uses synthetic betaine in the form of Betaine HCL or Anhydrous

The evidence research focused on understanding what happens at cellular level (in vitro) with synthetic betaine HCL and then in a heat stress model (in vivo) comparing all three product types. The fact that the later was done in poultry means little. It resonates and is applicable across species.

The explanation of why there could be a difference perhaps lies with the following key discoveries:

1. **Synthetic betaine HCL in Vitro model.**

This trial was conducted at the Danisco Animal Nutrition Kantvik Research Centre in Finland

- Produced a concerning response on gut cells by significantly ($P<0.05$) reducing transepithelial electrical resistance (TEER).
    - This means weakened junctions between gut cells allowing antigens to move across the gut barrier to provoke a damaging and energetically costly inflammatory response.
- Damagingly increased cell inflammation as indicated by significantly ($P<0.05$) higher cytokine IL-8 production.
    - Cytokine IL-8 activates an inflammatory response in immune cells. As above an energetically costly response.
- Had a negative effect on ATP content of cells by significantly decreasing the levels within the cells.
    - ATP is crucial to sustain metabolic functions within cells. You don't want to decrease it.

These discoveries go completely against the beneficial osmolyte function that comes from Betafin natural betaine.

See Technical report 56.

https://www.dropbox.com/s/j2qcygt26si69w7/Betafin.56%20Natural%20v%20hcl%20betaine_Technical_Report_Finland.pdf?dl=0

2. **Synthetic betaine anhydrous and HCl in vivo heat stress model in broilers.**

This trial was conducted at Massey University in New Zealand and the key findings were:

- Betafin natural betaine significantly ($p<0.05$) improved growth rate (8.8%) compared to numerical but insignificant increase by synthetic anhydrous betaine (6.3%) and synthetic betaine HCl (6.4%).

- Betafin natural betaine significantly ($p<0.05$) improved FCRc by 11 points (6.6%) compared with insignificant numerical improvements in FCRc with synthetic anhydrous betaine of 3 points (1.8%) and synthetic betaine HCl of 5 points (3.0%).

So synthetic betaine does not perform the same way as natural betaine and there is a clear performance difference with Betafin natural betaine being clearly superior. There appears no difference in synthetic anhydrous and synthetic HCl betaine.

See Technical report 55.

https://www.dropbox.com/s/vvm5qn4n3ltxlih/Betafin.55%20natural%20v%20syntheticTechnical_Report_New_Zealand.pdf?dl=0

DuPont has numerous studies from throughout the world showing the benefits of Betafin natural betaine. You'll see many of them in peer reviewed journals. Often these studies are used by companies selling synthetic betaine. Not something that we like, but it occurs.

So, all we can do is conduct good research, provide you with the evidence and knowledge to make informed decisions.

While it's our job, we do have a tiny bit of emotion attached to what Betafin brings to the table. Sorry!

The Environment

A paper recently commission by DuPont documents the findings of a comparative Life Cycle Analysis (LCA) of betaine production by three alternative pathways:

- natural betaine from DuPont (Betafin® natural betaine) and
- two synthetic betaine products relevant in today's marketplace.

This assessment has been conducted in line with the ISO 14040 – 14044 standards for comparative LCAs.

The assessment results demonstrate that with regard to carbon footprint (contribution to global warming potential) Betafin® natural betaine production is 76-80% less impactful than the synthetic alternative pathways.

Betafin® natural betaine outperforms the synthetic alternatives in 9 of the 13 total impact categories considered in the study, leading to a significantly less impactful and more sustainable product for our environment.

For full details on the paper please do not hesitate to contact us. See LCA report.

https://www.dropbox.com/s/lzwel1vlt9qugi8/Betafin__Natural_Betaine_Lifecycle_Analysis.pdf?dl=0

Betafin is natural, being produced through several filtration, separation and crystallization steps from sugar beet molasses, which is derived as a by-product of the sugar refining process. The only chemical used in the process is water.

The evidence appears to confirm again that through evolution Nature Does it Better and in this case and is better for Nature.