4t-fi™

TECHNICAL INFORMATION

Drinking water acidification by means of 4t-fi

Poor quality drinking water is often overlooked in animal production and can lead to reduced productivity and an over-reliance on antibiotics. Therefore, ensuring water which is suitable for consumption is absolutely key (Bowen, 2014). The nature of free-range production also raises the risk of water contamination. Poultry, for instance, coming in off the range will have pecked mud, faeces and dust, and then go straight to the drinkers. Substandard water is relatively common and can trigger adverse impacts on poultry productivity – not least bacterial imbalances in the gut, leading to an increase in antibiotic use. Producers will often look at feed if any performance challenges arise, although a bird or a pig will consume twice as much water as feed.

Table 1: Drinking water guidelines for animal production - from Böhm (2000)

	Pathogen count (CFU)
Salmonella	0 CFU in 100ml
Campylobacter	0 CFU in 100ml
E. coli	0 CFU in 10ml
Total (37°C)	<1,000/ml
Total (20°C)	<10,000/ml

The potential for organic acids to preserve feed and water quality lies in their ability to protect against microbial and fungal contamination and/or degradation. The free hydrogen proton of a dissociated organic acid lowers pH, thereby creating unfavourable conditions for bacterial pathogens. On the other hand, the un-dissociated form of organic acids directly penetrates the lipid membrane of Gram-negative bacterial cells. After entering cell cytoplasm at neutral pH, organic acids inhibit the bacteria's growth by inhibiting oxidative phosphorylation and causing increased energy expenditure (H^+-ATPase pump) (Lückstädt and Theobald, 2011).

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Using organic acids in drinking water rather than feed has a number of advantages (Wales et al., 2010). The ability to apply acids through water during feed withdrawal periods is especially important during pre-slaughter, when the animals' susceptibility to infection with bacterial pathogens may be increased (Ramirez et al., 1997; Byrd et al., 1998; Corrier et al., 1999). Organic acids in drinking water may also destroy or reduce any vegetative pathogens in the water. Acidifiers used via water can also be used strategically or throughout rearing, to suppress bacterial infections. Free acidifiers, however, are volatile and rapidly metabolised, and thus their efficacy may disappear already within the pipe system or only reaches the foregut.

Concentration is key

In order to overcome such disadvantages, Agritech has sourced a highly concentrated liquid product – **4t-fi,** which is produced in the manufacturers diformate reactor. Due to the special production process, it is more effective than free acids and easier in handling as well as safer in application. The product contains formic acid and sodium formate, coming from the diformate reaction process, thus it is close to its crystallisation point. This can be measured via the optical density (Fig. 1), which is 12.7% higher than comparable blends of formic acid and its sodium, salt.

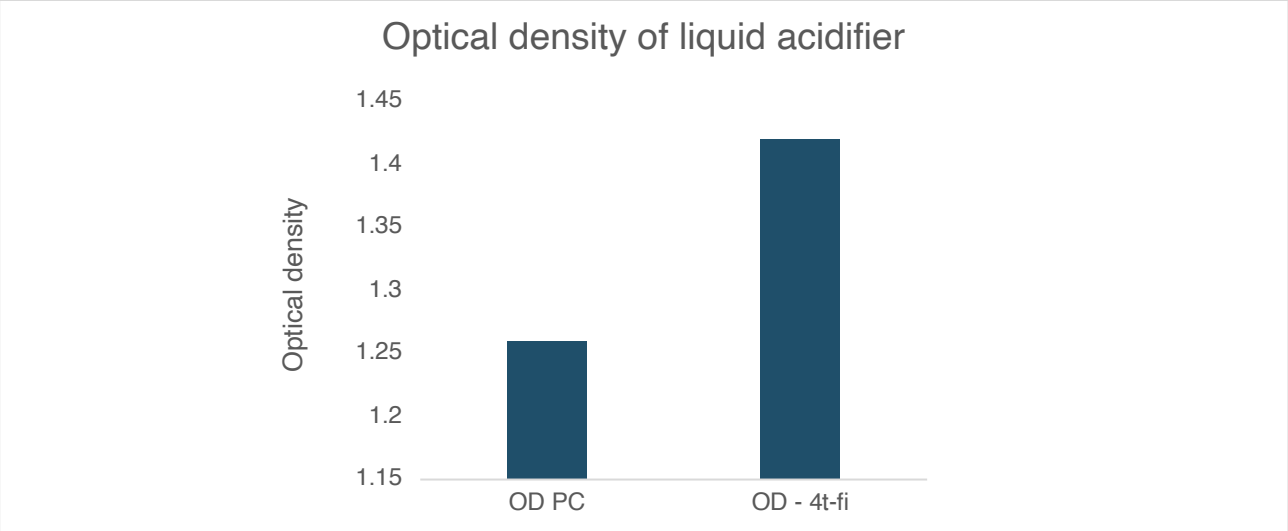

Figure 1: Optical density (OD) of a common formic acid – sodium formate blend (PC) and 4t-fi

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4t-fi advantages are:

- Its higher stability – the product can reach deeper into the GI-tract of animals, due to the higher OD-value

- Its composition – highest possible stable quantity of formic acid and its sodium salt, which are well known to improve productivity in animal nutrition

Especially formic acid is able to interfere with the growth of pathogenic gram-negative bacteria and is furthermore the only EU-approved organic acid to be a "hygiene condition enhancer". By acting against pathogens, the active ingredients of **4t-fi** help to decrease pressure to the animal's immune system. Furthermore, securing a low pH in the stomach will improve protein digestibility. It is imperative that the product remains available and active while being supplied. Often, liquid acidifiers will be already partly buffered in the piping systems of farms, due to biofilms or calcium carbonate deposits in the pipes. Some suppliers guarantee, after using their products, a low pH in the drinking water system for 5-6 hours. After that, pH usually starts to rise, due to the volatility of the organic acid and the product becomes inefficient.

The manufacturer has tested the pH-impact of **4t-fi,** in order to demonstrate the higher stability of the product, under accelerated conditions over 24 hours! The product was able to keep the pH stable over the whole test period.

The use of **4t-fi** via the drinking water or liquid feed will therefore not only create hygienic conditions, but also lead to improved performance parameters in poultry and pig.

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