



# FEED INGREDIENTS

## USING ANTIOXIDANTS TO MANAGE OXIDATION AND PRESERVE QUALITY

by Adisseo

**O**xidative degradation is a continual process that begins when feed ingredients are used. This process continues during production and storage, and only comes to an end once the feed is consumed (see Figure 1).

These key milestones in the life of the product are where nutrient quality and safety can decline and taking action during these milestones ensures high-quality, safe feed.

Antioxidants are a crucial element of any livestock diet, as they preserve valuable nutrients and protect the diet from oxidation, ensuring optimal animal health, performance and carcass quality. They are powerful molecules that serve two purposes in livestock diets.

The first is to keep the feed fresh, mainly by preventing the fats and oils from going rancid through a process known as lipid oxidation. The second is to keep the livestock healthy by preventing free radicals in the body from damaging cells and having a deleterious effect on various biological functions.

### **An efficient antioxidant**

The following is a list of three key features of an efficient

antioxidant, which are applied in order to prevent oxidative degradation.

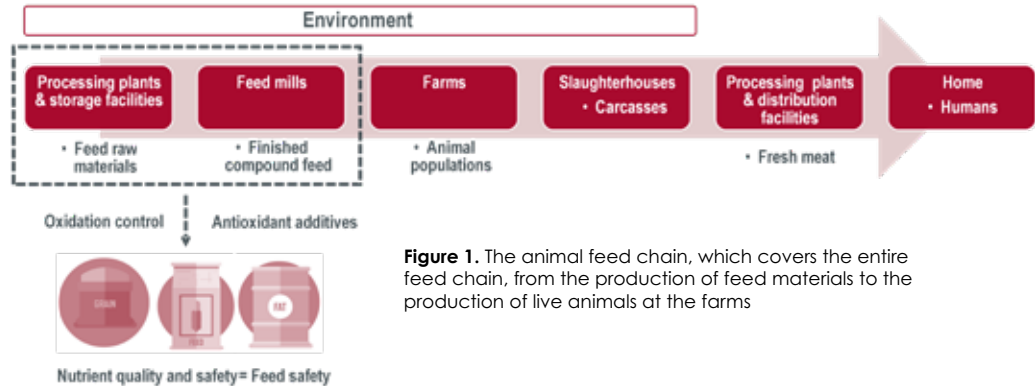
Oxidation occurs in three stages: initiation, propagation and termination. Each active ingredient in an antioxidant blend helps to slow or prevent a different stage in the chain reaction. As a result, a blend of active ingredients will yield better antioxidant activity than a single ingredient.

Secondly, the complete feed is a complex substrate. The negative effects of oxidation are mitigated when a complete antioxidant program is applied, properly stabilising the fat and oil sources and the valuable nutrients used in the complete feed.

Finally, synergism between antioxidants actives is guaranteed in specific conditions. For example, in a blend of BHA-propyl gallate, after the first antioxidant action of the BHA and propyl gallate molecules, the secondary metabolite of BHA and propyl gallate will combine. This will result in the formation of heterodimers that have an antioxidant activity which is more efficient than the activity of BHA or propyl gallate as such.

### **Satisfying regulations & consumer needs**

There are many sources and forms of antioxidants and Adisseo offer a diverse portfolio of synthetic antioxidant systems for fats, oils, premixes and complete feeds, as well as natural antioxidant alternatives in both dry and liquid forms.



**Figure 1.** The animal feed chain, which covers the entire feed chain, from the production of feed materials to the production of live animals at the farms

Antioxidant blends developed by the company contain synergistic mixes of antioxidants to absorb free radicals, metal chelators to bind metal ions and oil-based carriers to ensure optimal homogeneity in the fat/oil or feed matrix, the combination of which produces a stability solution that is more efficacious than single-component antioxidants.

Given the changing nature of regulations and potential safety concerns, antioxidants are becoming more and more of a specialty business. Consequently, the company has invested and innovated significantly in its antioxidant product line, Oxy-Nil. It is Adisseo's first priority to guarantee safe and effective feed additives, and to provide valuable solutions to the global feed industry.

One of the proven success stories of our antioxidant portfolio is the synergistic combination of



BHA-BHT-propyl gallate antioxidants and chelating agents. This synergistic blend has been available to the animal feed markets for several years now and has proven to offer high levels of efficacy.

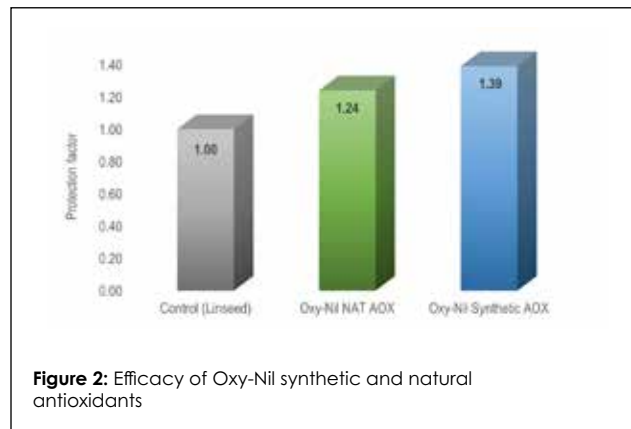
Propyl gallate is able to restore and increase the effects of BHA and BHT threefold in some instances, by transferring hydrogen ions from its three active sites to oxidised (spent) BHA or BHT molecules.

In addition, the effectiveness of an antioxidant depends on multiple factors, including the substrate, antioxidant dose, chemistry synergy, and time and place of application. Considering the wide variability of fats and oils, and the valuable mineral nutrient premix used today, the need for oxidation control solutions designed specifically with variability in mind is increasing (see Figure 2).

In order to meet the emerging need for natural antioxidants, Adisseo continuously tests new possible ingredients with potential antioxidative properties, such as natural plant-based antioxidants consisting of synergistic mixes of natural tocopherols, rosemary extract, chelators and emulsifiers, for complete protection against oxidation.

Mixed tocopherols contain  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$  homologues with each a different biological and antioxidant activity.  $\delta$  homologue is known to have a more superior antioxidant activity while  $\alpha$ -tocopherol is known to be easily absorbed in-vivo, hence promoting better vitamin-E activity.

Consequently, the efficacy and value of our natural antioxidant is based on higher delta-gamma ratios, the delta-difference. The higher ratio of delta tocopherols in combination with a lecithin chelator and rosemary extract support an efficient natural antioxidant blend for the feed industry.



### Unique services

One of Adisseo's aims is to help its customers use fats, oils, premixes and complete feeds advantageously, while preserving their quality through a coordinated quality management program. This program includes product application advice in each specific situation and laboratory services.

These services include an evaluation of the oxidative quality of feed and feed ingredients, focusing on a complete oxidative profile, future oxidation assessments and antioxidant recovery, to identify the correct and most cost-effective solution.

This is part of the strategic approach that is just one of its market differentiators, taking the position that we "don't just sell products" – we support the products that we produce.