

**Advanced
Antioxidant
Solutions for
Animal Nutrition**

OXIPROTECT

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OXIPROTECT™ Feed AO-LQ

"Natural-based" liquid antioxidant for fats, oils, and high-fat feed

The new generation liquid antioxidant system based on natural tocopherols and lipophilic/hydrophilic synergists represents a significant advance in the protection of fats, oils, and feed. Specifically designed to replace and improve standard antioxidants based on simple tocopherols or traditional BHA/BHT, OXIPROTECT™ Feed AO-LQ offers a comprehensive solution that combines superior efficacy with a favourable market perception.



Natural extract rich in mixed tocopherols

High purity and effective E306



Ascorbyl palmitate

E304 – regenerator and lipophilic synergist



Citric acid

E330 – effective metal chelator



Refined vegetable oil

Food-grade carrier

All components fall within the framework of technological additives – antioxidants according to Regulation (EC) 1831/2003 and substances permitted in animal feed, ensuring full regulatory compliance in the European market and adaptability to international regulations.

Main applications

- Vegetable oils and animal fats
- Protein meals with residual fat
- Complete feeds for poultry, pigs, and ruminants
- Vitamin and mineral premixes
- Dry pet food with fat content above 12%

Indicative dosage

150–500 g/t of fat or feed

Dosage should be adjusted according to the peroxide value, level of polyunsaturated fatty acids (PUFA), and the specific shelf-life requirements of the final product.



Poultry sector

Optimal protection in high-energy feeds



Pig production

Stability in matrices with high fat content



Ruminant livestock

Prevention of rancidity in supplements

Key Benefits of the System

1

Superior Performance

The synergy between E306 + E304 + E330 provides significantly superior antioxidant protection compared to standard tocopherols used in isolation.

2

"Label-Friendly" Perception

Ideal for manufacturers sensitive to natural ingredients and with marketing strategies focused on clean label and natural products.

3

Economic Optimisation

Improves oxidative stability at lower doses, resulting in significant savings in cost per tonne of final product.

4

Operational Ease

Optimal fluidity and easy in-line incorporation into the production line, minimising downtime and maximising process efficiency.

📄 **Available Formats:** Liquid in 5–25 kg, 200 kg presentations and 1,000 kg IBC containers, adapting to different production scales.

OXIPROTECT™ Feed AO-SX

High-Performance Hybrid Antioxidant for Highly Unstable Matrices

The synergistic antioxidant system OXIPROTECT™ Feed AO-SX combines natural and synthetic ingredients to offer protection under extreme conditions. Specifically developed for recycled fats, fish meals, oils rich in polyunsaturated fatty acids (PUFA), and thermally demanding matrices, this product represents the ideal solution for replacing Ethoxyquin-based systems in markets where it is restricted or prohibited.

The hybrid formulation leverages the best of both worlds: the positive perception of natural tocopherol extracts combined with the proven efficacy of carefully selected synthetic antioxidants. This strategic combination allows for achieving levels of antioxidant protection that significantly surpass systems based exclusively on natural or synthetic ingredients used individually.

OXIPROTECT™ Feed AO-SX



All ingredients are authorised for use in animal feed as technological antioxidants, adapting doses to the specific regulation of the country of destination. The flexibility in formulation allows the composition to be adjusted according to legal requirements and target market preferences.

Strategic Applications

Protein Ingredients

- Fishmeal
- Meat meals
- Processed by-products

Functional Oils

- Fish oils
- Algal oils (EPA/DHA)
- Recycled animal/vegetable fat

Final Products

- Aquaculture feeds
- Economy pet food
- High-lipid premixes

01

Matrix evaluation

Analysis of unsaturation level and processing conditions

02

Dose determination

50–250 g/t depending on matrix and stability objective

03

In-line incorporation

Homogeneous application during the production process

04

Efficacy verification

Monitoring of peroxide values and temporal stability

OXIPROTECT™

Protective AntiOx Products for Feed Industry

Competitive Advantages

Superior stability

Much superior protection against primary and secondary oxidation, significantly extending the product's shelf life

Sensory quality control

Drastically reduces the appearance of rancid odours and the formation of undesirable aldehydes that affect palatability

Regulatory optimisation

Allows for reduced levels of synthetics while maintaining efficacy, resulting in a more commercially acceptable option

Alternative to Ethoxyquin

A real technical solution in markets where Ethoxyquin is restricted or has been phased out due to consumer pressure

Proven profitability

Excellent cost per tonne versus efficacy ratio, optimising return on investment in antioxidant protection

- **Available formats:** Liquid in 5–25 kg, 200 kg and 1,000 kg presentations to adapt to different production volumes and facilitate storage logistics.



Powdered antioxidant for flours, premixes, and farinaceous feeds

The OXIPROTECT™ GrainGuard DRY antioxidant system represents an innovation in the protection of dry matrices where the use of liquid antioxidants is not technically viable or presents operational inconveniences. This granular and fluid system has been specifically designed to ensure perfect dispersion and provide antioxidant protection from the earliest stages of the manufacturing process.

The controlled adsorption of active ingredients onto a carefully selected mineral carrier ensures homogeneous distribution throughout the entire feed or premix mass, eliminating segregation or localised concentration problems that can occur with other formats. This adsorption technology also protects active ingredients from possible degradation during storage and transport.



Adsorbed natural tocopherols

E306 on food-grade mineral carriers



Mineral carriers

Precipitated silica, calcium carbonate or phosphate



Powdered citric acid

Micronised E330 for optimal dispersion

The formulation may optionally include small quantities of propyl gallate, BHA or BHT according to the specific needs of the client and the requirements of the target market, allowing for customisation of the antioxidant protection level and adaptation to different labelling preferences.

Application sectors



Vitamin and mineral premixes

Comprehensive protection from the core formulation, preventing the oxidative degradation of sensitive vitamins such as A, D and E during storage and transport.



Processed feeds

Ideal for farinaceous, granulated and pelleted feeds, providing antioxidant protection during and after the thermal pelleting process.



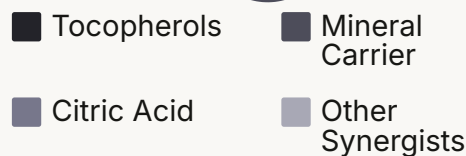
Dry pet food

Effective protection in dry pet foods, especially in formulations with oxidation-sensitive ingredients and during extrusion.

Dosage and Handling

The recommended guideline dosage is in the range of **300–1000 g/tonne of feed**, which should be adjusted according to the fat content of the matrix, the level of oxidation-sensitive ingredients (such as fish meals or polyunsaturated oils), and the established shelf-life objectives.

The powder format allows for precise incorporation using gravimetric or volumetric dosing systems, integrating perfectly into existing manufacturing processes without the need for significant modifications to production lines.



Operational and Technical Advantages

Clean and safe handling

No spills, drips, or incompatibilities with dosing equipment, reducing cleaning times and minimising product losses.

Perfect fluidity

Prevents the formation of "hot spots" of antioxidant concentration and ensures homogeneous distribution throughout the mixture.

Early protection

Allows for the introduction of antioxidant protection in the premix phase, not only during the final fat coating of the feed.

Formulation versatility

Can be configured as a completely natural version without synthetics for premium markets or with synthetic reinforcement for maximum efficacy.

- ☐ **Supply formats:** Available in 10–20 kg bags for small and medium productions, and in big-bags on demand for large manufacturers requiring higher volumes.

OXIPROTECT™

Protective AntiOx Products for Feed Industry

OXIPROTECT™ PetPremium NAT

100% natural antioxidant system for premium pet food

OXIPROTECT™ PetPremium NAT is an advanced natural antioxidant system specifically designed to meet the demands of the premium segment of the pet food market. This product responds to the growing consumer demand for pet foods with clean labels, recognisable natural ingredients, and a complete absence of synthetic additives, without compromising oxidative stability or product shelf life.

The premium pet food market has experienced exponential growth in recent years, driven by increasingly informed and demanding pet owners who seek products for their companion animals with quality standards similar to those of human food. This market segment particularly values transparency in labelling, ingredient traceability, and the use of natural-origin additives.



Natural Tocopherols (E306/E307)

Concentrated extracts from non-genetically modified vegetable oils, providing the system's main antioxidant base with fat-soluble activity.



Deodorised Rosemary Extract

Authorised natural flavouring that provides secondary antioxidant components (carnosic acid and carnosol) without negative organoleptic impact.



Citric Acid (E330)

Natural-origin metallic chelator that enhances the action of tocopherols by inactivating pro-oxidant catalysts.



Vegetable Oil as Carrier

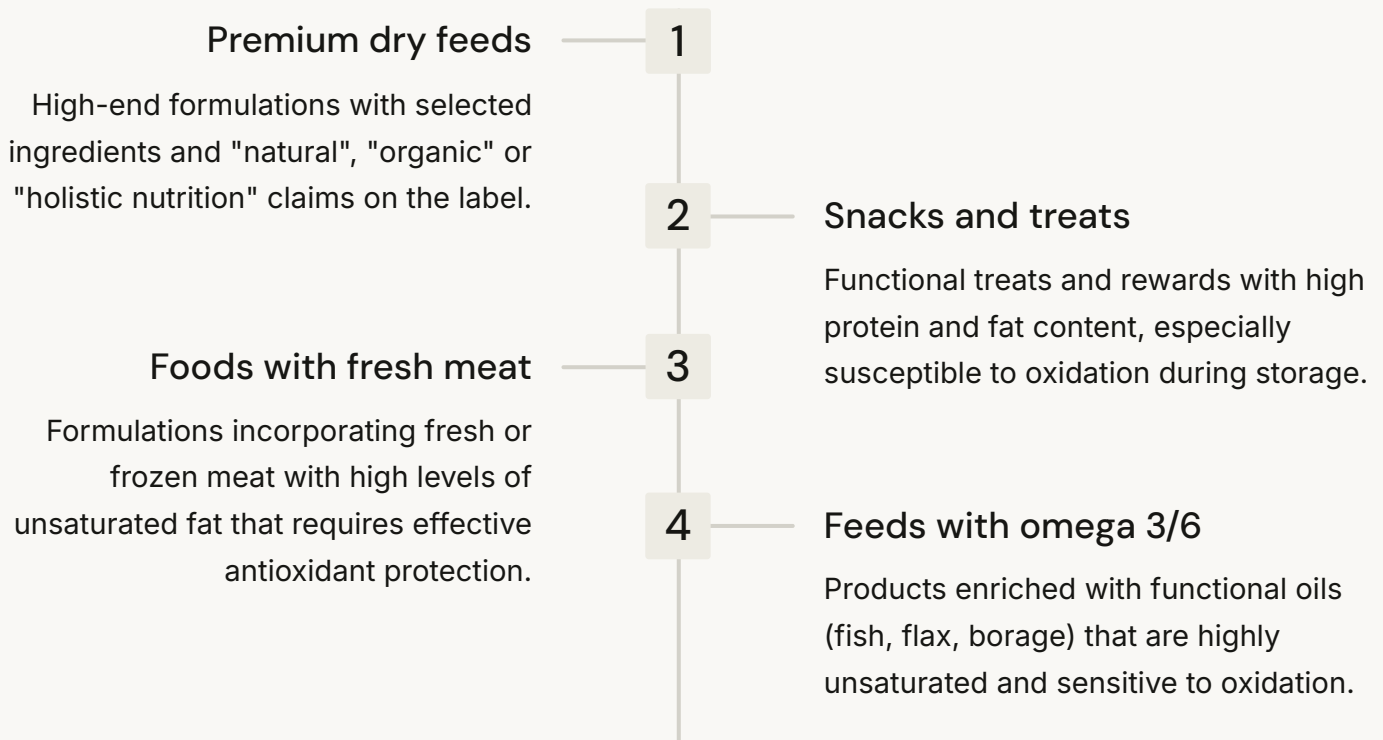
Food-grade carrier that facilitates the homogeneous incorporation of the antioxidant system into the feed matrix.

Rosemary extract is authorised as a flavouring in animal feed according to European regulations, and its antioxidant contribution, although secondary, is technologically valuable and completely legal. The deodorised version used in this formulation eliminates the intense aromatic notes of rosemary that could be undesirable in some products, while maintaining its functional properties.

OXIPROTECT™

Protective AntiOx Products for Feed Industry

Applications in the pet food market



Recommended Dosage

The indicative dose is in the range of **200–600 g/t**, and should be adjusted mainly based on the total fat content of the final product and the level of polyunsaturated fatty acids present.

For products with fat content exceeding 15% or with significant inclusion of fish oils or other omega 3-rich oils, it is recommended to work at the upper end of the dosing range.

Target segments

- **Grain-free:** Cereal-free formulations
- **Human grade:** Ingredients suitable for human consumption
- **Holistic nutrition:** Comprehensive and balanced nutrition
- **Organic:** Certified organic production
- **Limited ingredient:** Limited and selected ingredients

OXIPROTECT™

Protective AntiOx Products for Feed Industry

Benefits for manufacturers and brands



Immediate premium positioning

The declaration "100% naturally derived" or "antioxidants of natural origin" on the label provides a clear competitive advantage in the premium segment, justifying higher prices.



No organoleptic impact

The use of deodorised rosemary ensures the absence of intense herbaceous aromatic notes that could negatively affect the product's palatability.



Extended shelf life

Significantly increases oxidative stability without resorting to BHA, BHT or propyl gallate, responding to the conscious consumer's expectations.



Compatibility with premium claims

Compatible with the most demanding claims in the premium pet food market: "grain free", "human grade" and "holistic nutrition".

❏ **Available formats:** Liquid in 5–25 kg containers for small artisanal producers, 200 kg drums for medium-sized manufacturers, and 1,000 kg IBC containers for large industrial productions.



OXIPROTECT™ AquaGuard

Specialised antioxidant for aquaculture feeds rich in EPA/DHA

OXIPROTECT™ AquaGuard is an ultra-efficient antioxidant system specifically developed to address the unique challenges presented by highly polyunsaturated matrices used in modern aquaculture. Marine oils rich in long-chain omega-3 fatty acids (EPA and DHA) are extremely susceptible to oxidation due to their high degree of unsaturation, which can result in significant losses of nutritional value, deterioration of palatability, and the formation of toxic compounds.

The aquaculture industry faces increasing pressure to eliminate or reduce the use of Ethoxyquin, a traditionally very effective synthetic antioxidant but one that has generated regulatory and consumer perception concerns in various markets. OXIPROTECT™ AquaGuard has been designed to replace or complement Ethoxyquin-based strategies, providing a comparable or superior level of antioxidant protection through a synergistic combination of authorised natural and synthetic ingredients.

Natural Tocopherols (E306)

Primary antioxidant base with specific fat-soluble activity for polyunsaturated fatty acids

Propyl gallate (E310)

Powerful synergist especially effective in systems with high EPA/DHA content

Ascorbyl Palmitate (E304)

Regenerative antioxidant that extends the activity of tocopherols in lipid systems

Citric Acid (E330)

Metal chelator that inactivates pro-oxidant catalysts present in marine ingredients

Food phosphates

Complementary chelators that reinforce protection in variable pH conditions

The carrier used in OXIPROTECT™ AquaGuard strategically combines refined fish oil with vegetable oil, ensuring optimal compatibility with aquaculture lipid matrices and facilitating homogeneous incorporation of the antioxidant system.



Applications in the aquaculture value chain



Raw materials

Protection of fish meal and oil from production, maintaining the fatty acid profile during transport and storage.



Complete feeds

Stabilisation of feeds for marine species (salmon, sea bream, sea bass) and freshwater species (trout, tilapia, pangasius).



Functional additives

Protection of omega-3 rich premixes and supplements intended for nutritional enrichment.

Stratified dosage

Complete feed

150–400 g/t

Base dose for protection of finished feed, adjustable according to total fat content and storage conditions.

Pure fat phase

500–1500 g/t

High concentration for direct protection of oils and fats before incorporation into feed.



Competitive Advantages for Aquaculture

1 Superior EPA/DHA Protection

The system provides exceptional protection for long-chain omega-3 fatty acids against primary oxidation (peroxide formation) and secondary oxidation (aldehyde, ketone, and other volatile compound formation), preserving their nutritional and functional value throughout the product's shelf life.

2 Significant Sensory Improvement

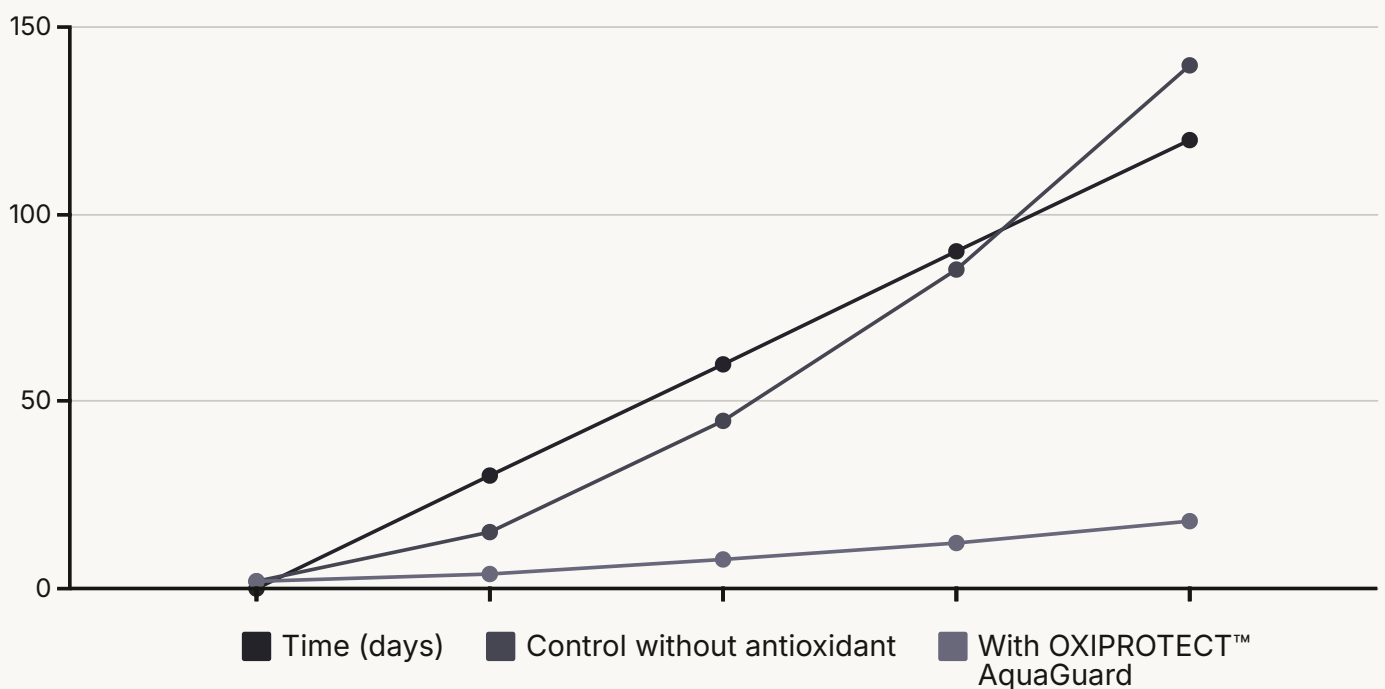
It drastically reduces the appearance of oxidised fish aromas and flavours ("rancid") and the formation of undesirable volatile compounds, improving feed palatability and, consequently, feed conversion rates. The colour of the feed and raw materials remains more stable during storage.

3 Regulatory Alternative to Ethoxyquin

It provides a real and effective technical solution in markets where Ethoxyquin is restricted, prohibited, or generates commercial rejection. The formulation is customisable to adapt to different regulatory contexts, allowing the proportion of natural versus synthetic ingredients to be adjusted according to the needs of the target market.

4 Processing Optimisation

It improves isothermal stability during high-temperature extrusion processes and during the post-fattening phase, critical moments when the product is especially exposed to pro-oxidant conditions. It reduces quality losses during storage in tropical or high humidity conditions.



The graph shows the evolution of the peroxide value (meq O₂/kg) in fish oil stored at room temperature.

OXIPROTECT™ AquaGuard keeps the value below 20 meq/kg even after 120 days, whilst the control without antioxidant exceeds quality limits in less than 60 days.

- ☐ **Supply formats:** Available in liquid format in 5–25 kg containers, 200 kg drums, and 1,000 kg IBC containers, adapting to the logistical needs of producers of different scales.

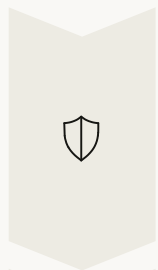


OXIPROTECT™ MultiShield

Antioxidant + preservative for dual-risk feed (oxidation + moulds)

OXIPROTECT™ MultiShield represents a strategic innovation in the comprehensive protection of animal feed, combining antioxidant and antimicrobial functionality in a single product. This dual-action system simultaneously provides control of lipid oxidation and effective protection against the growth of undesirable moulds, yeasts, and bacteria, addressing two of the main deterioration factors in the animal feed industry.

MultiShield's dual formulation addresses a practical need for feed manufacturers: simplifying additive management, reducing the number of dosing points on the production line, minimising operational errors, and optimising storage space. By integrating two critical functionalities into one product, operational efficiency is significantly improved, and the risk of dosing errors that can compromise the quality and safety of the final product is reduced.



Base antioxidant system

Can be configured with the AO-LQ platform (natural-based) for premium applications or with GrainGuard (powder) depending on the physical characteristics of the target matrix and customer preferences.



Preservative components

Organic acids and their salts (propionic, formic, sorbic) selected for their proven antimicrobial efficacy and broad authorisation in animal feed globally.

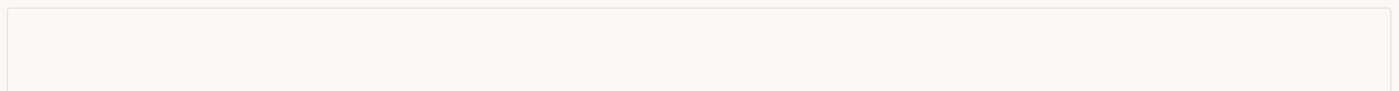
Customisable modular composition

Antioxidant module

- AO-LQ base system (tocopherols + synergists)
- Or GrainGuard DRY system (powder format)
- Customisable according to labelling requirements

Preservative module

- Propionic acid or calcium/sodium propionate
- Formic acid (potentiated against Salmonella)
- Sorbic acid (specific anti-yeast)



Strategic Applications



Poultry Feed

Especially critical in pullet and layer feeds where fungal contamination can compromise egg production, and in broiler feeds in hot and humid climates.



Pig Feed

Dual protection in piglet and finishing pig feeds, especially important in formulations including by-products or ingredients with microbial risk.



Ruminant Nutrition

Applicable in concentrates, supplements, and complete rations, particularly valuable in wet feeding systems or with fermentable ingredients.

Vulnerable Raw Materials

Ingredients with high residual moisture or a history of fungal contamination require enhanced protection.

Operational Simplification

Factories looking to reduce dosing points and optimise additive management.

1

2

3

Adverse Climatic Conditions

Tropical regions or summer periods with high humidity and temperature multiply the risk.

Quality Parameter	Without MultiShield	With MultiShield
Peroxide index at 60 days (meq/kg)	28	8
Mould count (CFU/g)	5.2×10^4	$< 10^2$
Guaranteed shelf life (days)	45	120
Rejection rate due to quality (%)	3.8	0.4

📄 **Available Formats:** MultiShield is manufactured in liquid or powder format according to the configuration of the selected antioxidant base. Available in multiple packaging formats adapted to different production volumes: from 10-20 kg containers for small manufacturers to 1000 kg IBCs for large industrial plants.

Dosage and Efficacy

The recommended dose of OXIPROTECT™ MultiShield is in the range of **1–4 kg/tonne of feed**, and should be adjusted based on multiple factors: initial microbial load of raw materials, moisture content of finished feed, anticipated storage conditions, desired level of antioxidant activity, and specific market or target species requirements.

65%

Reduction in Losses

Decrease in waste due to combined deterioration (oxidation + moulds)

45%

Extended Shelf Life

Average increase in storage days for stored feed

30%

Reduction in Operating Costs

Savings in additive management and reduction of quality rejections

Operational and Economic Benefits

Logistical Simplification

A single product unifies two critical functionalities, reducing the number of references to store, control points in the production process, and the associated complexity of document management.

Error Reduction

By having a single dosing point for both protections, operational errors that can occur when handling multiple additives separately are drastically minimised, improving traceability and quality control.

Synergistic Integral Protection

The combination of both protection mechanisms not only addresses oxidation and microbial contamination independently, but also generates synergistic effects: preservatives reduce the microbial load that can accelerate oxidative processes, while antioxidants prevent the formation of compounds that can serve as substrates for microorganisms.

Economic Optimisation

Dual protection significantly reduces waste and rejections due to deterioration during storage and transport, extends the commercial life of the feed allowing for longer-distance distribution, and improves final customer satisfaction by guaranteeing a product of constant quality until consumption.

Range

OXIPROTECT™

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