by Furfural Español S.A.

NUTROX OS

GENERAL INFORMATION

The consumer's recent interest in "natural" products requires natural antioxidative substances to replace conventional antioxidants in food such as BHT and BHA.

Rosemary leaves are a source of highly active antioxidants belonging to the group of diterpene phenols. Nutrox OS is a natural extract from rosemary leaves, obtained with our own technology which controls aroma, flavour, and antioxidant activity.

Nutrox OS is a natural flavouring that can stabilize fats and oils against rancidity, and retard colour fade caused by degradation of carotenoid and fresh meat pigments.

Rancidity results when oxygen reacts with lipids. This is an auto-propagated free radical reaction generated in the first oxidation steps. The compounds responsible to broke oxidation chain are the diterpenes, Carnosic Acid and Carnosol.

Carnosic acid is the most important active component of Nutrox OS. Carnosic acid has been suggested to account for over 90% of the antioxidant properties of rosemary extracts. Carnosic acid is powerful inhibitor of lipid peroxidation in microsomal and liposomal systems, and is good scavenger of peroxyl radical and superoxide anion.

Nutrox OS is suitable to be used in any food product containing fat or oil, even those considered low fat. Also is especially suitable to protect degradation of carotenoid pigments, particularly paprika oleoresin.

Recent research have demonstrated that when rosemary antioxidants are added to ground beef the amount of cancer-causing substances as heterocycles amines or HCAs created during cooking process are reduced.

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FOOD APLICATIONS

Nutrox OS has an antioxidant activity comparable to that of synthetic antioxidant and can be used in many food products as:

Fat and oils	Baked Goods	Fresh Sausages
Butter	Cereals	Poultry and Meat
Flavourings	Breading	Sliced cured meat
Salad dressings	Snacks foods	Deep fried foods
Mayonnaise	Confectionery Products	Fresh and frozen fish
Soups	Dehydrated foods	Frozen products

Recommended doses depend of the final application but normally range from 0.01-0.1% based on fat content.

As a liquid completely oil soluble can be added directly into fat or oil, mixed during meet ground, spraying on the surface of products, etc. The main application, doses (based on fat content) and incorporation technique for Nutrox OS are shown in the following table:

Applications	**Dosage Levels**	**Incorporation Technique**
Oils and Fats	0.01-0.1%	Add before mixing
Flavourings	0.02-0.1%	Direct addition
Paprika Oleoresin	0.05-0.1%	Add during pigment extraction
Snacks and soup	0.05-0.1%	Add directly to the fat or oil
Fish products	0.05-0.1%	Add directly to mixer or in oil
Dressing- mayonnaise	0.01-0.05%	Add to the oil before mixing
Meats or Poultry products	0.05-0.1%	Add directly to mixer
Baked and confectionery products	0.02-0.05%	Add directly to the fat or oil and knead, or sprayed

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ANTIOXIDANT ACTIVITY

A comparative study on the antioxidant activity of common food antioxidant and Nutrox OS by measure of Protection factor in sunflower oil oxidation with Rancimat method is shown in the following table:

Antioxidant added	Dose (ppm)	Protection factor	Times vs Vit E
Tocopherol	200	1.47	1.00
BHA*	100	1.13	0.77
Ascorbylpalmitate	200	1.16	0.79
Propylgallate*	100	1.50	1.02
Nutrox OS	500	1.94	1.18

* Legal limit to be added in food.

The following data show the antioxidant activity (PF) of tocopherol and Nutrox OS in different oil matrixes with Rancimat method:

Oil Base	Tocopherol	Nutrox OS	Times vs Vit E
Sunflower oil	1.47	1.94	1.18
Soybean oil	1.01	1.29	1.28
Rapeseed oil	0.93	1.12	1.20
Fish oil	2.37	2.65	1.12
Borage oil	1.01	1.48	1.46
Primrose oil	1.05	1.65	1.57
Palm oil	1.07	1.09	1.02

When tocopherol and Nutrox OS are mixed oxidation data show a synergic behavior given a PF of 3.03 against the 2.37 and 2.65 values for tocopherol and Nutrox separately.