LIFE ESSENCE

More than antioxidant

COMBATOX

Food grade antioxidant





Keep your Flavor and odor a fresh

The product may be accepted or rejected depending entirely on the freshness of flavor and aroma. Oxidation causes deterioration of these important qualities, resulting in foods with unpleasant flavors and unappetizing odors. Improvements in food preparation, storage temperatures, and packaging help to retard oxidation but may not be satisfactory or economically feasible in many instances. Consequently, substances are needed that can be introduced directly into the food product to inhibit the destructive processes that result in rancidity. For the food processor, Life Essence Combatox™ food-grade antioxidants meet this need.

Combatox™ TBHQ food-grade antioxidant

is Life Essence's most effective antioxidant for highly unsaturated vegetable oils and many edible animal fats. It will effectively "carry through" from frying oils and provide excellent stability to finished foods. Combatox TBHQ can be used with BHA and/or BHT in meat and poultry products to provide maximum protection..

Combatox ™ BHA food-grade antioxidant

can be easily applied to food items because of its outstanding solubility in fats and oils. It is renowned for its carry-through effect into baked foods, providing extended shelf life. Combatox BHA imparts excellent stability to an array of food products, fats, oils, vitamins and packaging materials.

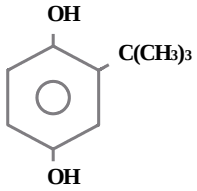
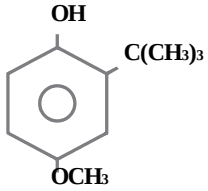
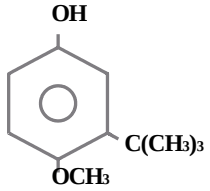
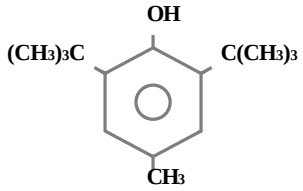
Combatox ™ BHT food-grade antioxidant

offers excellent solubility in fats and oils and provides carry-through effectiveness in baked foods. Used singly or with other Combatox antioxidants, it imparts stability to fats, oils, cereals, and packaging materials.



Table 1

Physical properties

	Eastman Tenox™ TBHQ food-grade antioxidant	Eastman Tenox™ BHA food-grade antioxidant		Eastman Tenox™ BHT food-grade antioxidant
				
	tertiary butylhydroquinone	**3-tertiarybutyl-4-hydroxyanisole**	**2-tertiarybutyl-4-hydroxyanisole**	**3,5-di-tert-butyl-4-hydroxytoluene**
Molecular weight	166.22	180.25		220
Physical appearance	White to light tan powder	White to slightly yellow solid		White granular crystals
Boiling point, 760 mm Hg, °C	300	264–270		265
Melting point, °C	126.5–128.5	48–63		69.7
Odor	Very slight	Slight		Very slight

Solvent	**Solubility, % (approx .)**		
Water, 25°C	,0.4	,0.1	Insoluble
Glycerol, 25°C	23	1	Insoluble
Ethyl alcohol, 25°C	60	80	32
Propylene glycol, 25°C	30	63	2
Cottonseed oil, 25°C	10	30	27
Corn oil, 25°C	10	30	26
Canola oil, 25°C	6	30	26
Soybean oil, 25°C	10	30	26
Palm oil, 50°C	10	65	55
Lard, 50°C	15	65	50



Table 2

Food and Drug Administration (FDA)

Food additive regulation	Application	Permitted antioxidant	Limitation or tolerance (Percent by weight of food unless otherwise specified)	
21 CFR 182.3169	General uses	BHA	0.02% (200 ppm) singly or in combination, by weight, in fat or oil portion of food including the essential (volatile) oil except where prohibited by Standard of Identity	
21 CFR 182.3173		BHT		
21 CFR 172.185		TBHQ		
Specific foods				
21 CFR 172.185	Ghee and vegetable frying oils	TBHQ	0.02% (200 ppm)	
21 CFR 172.615	Chewing-gum base	BHA, BHT	0.1% (1,000 ppm) singly or in combination	
21 CFR 172.515	Synthetic flavoring substances and adjuvants	BHA	0.5% (5,000 ppm) of flavoring oil	
21 CFR 172.110	Active dry yeast	BHA	0.1% (1,000 ppm)	These limits on total product weight
	Beverages and desserts from dry mixes		0.0002% (2 ppm)	
	Dry mixes for beverages and desserts		0.009% (90 ppm)	
	Dry diced glazed fruit		0.0032% (32 ppm)	
21 CFR 172.110 and/or 21 CFR 172.115	Dry breakfast cereals	BHA and/or BHT	0.005% (50 ppm)	
	Emulsion stabilizers for shortening		0.02% (200 ppm)	
	Potato granules		0.001% (10 ppm)	
	Potato flakes, sweet potato flakes, and dehydrated potato shreds		0.005% (50 ppm)	
Food standards				
21 CFR 137.350	Enriched rice	BHT	0.0033% (33 ppm)	
21 CFR 161.175	Frozen raw breaded shrimp	BHA, BHT	0.02% (200 ppm) on fat or oil content	
21 CFR 166.110 and 9 CFR 318.7	Margarine	BHA, BHT, TBHQ	0.02% (200 ppm) singly or in combination based on finished product (TBHQ based on fat or oil)	

European Community — Directive 95/2/EC

Permitted antioxidant	EC regulations
TBHQ	E319
BHA	E320
BHT	E321

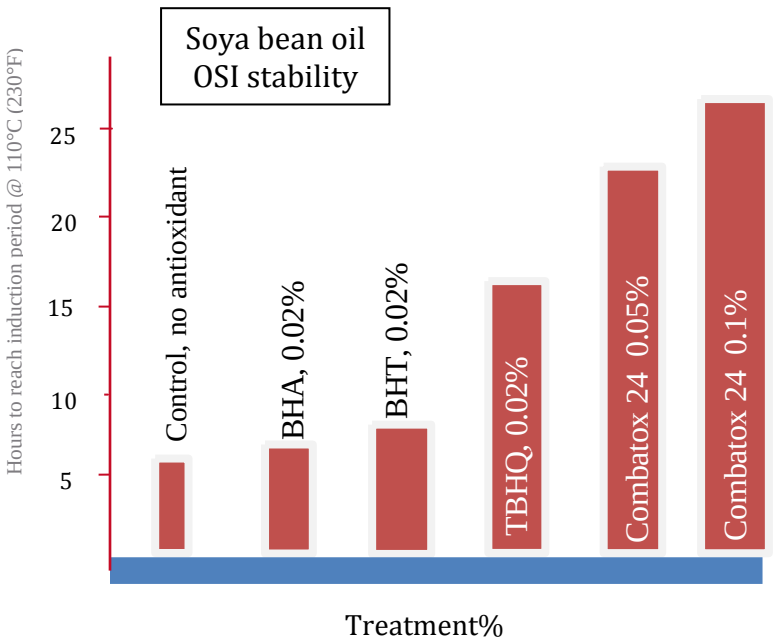
Typical properties

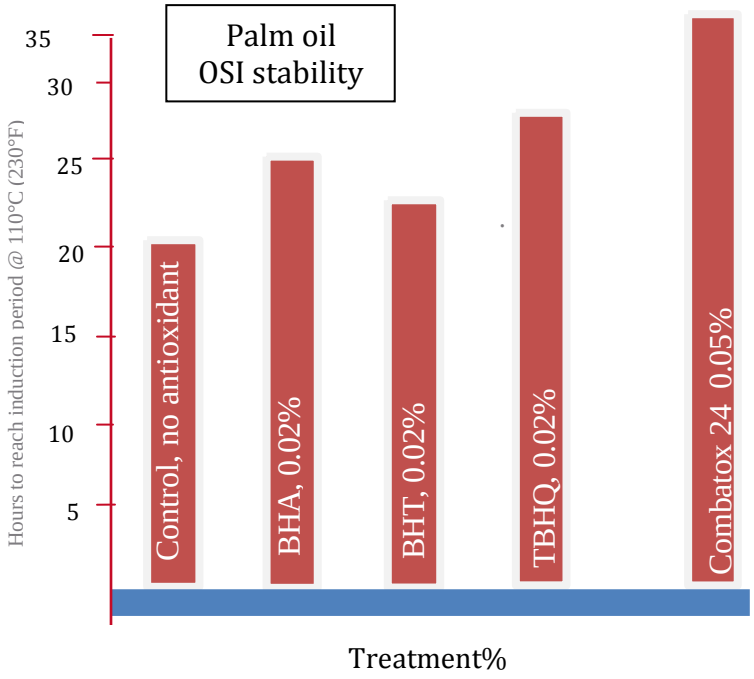
Table 3

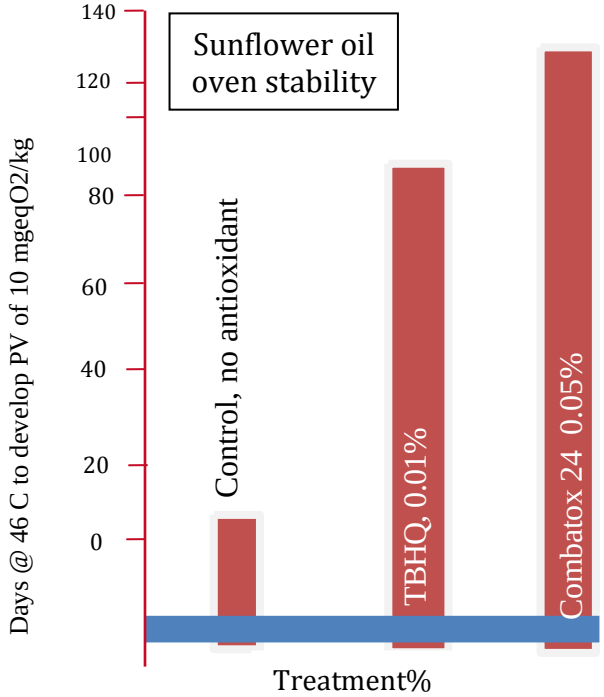
Food-grade antioxidant solution	Color	Viscosity @ 25°C, cPb	Specific gravity, 20°/20°C	Solubility in fats and oils	Effectiveness in vegetable oils	"Carry through" in baked foods
Combatox 40	Light straw	61	0.942	Excellent	Good	Excellent
Combatox 40B	Light straw	69	0.951	Excellent	Good	Excellent
Combatox 30	Light straw	58	0.932	Excellent	Good	Excellent
Combatox 24	Light amber	65	1.087	Good	Excellent	Good
Combatox 24A	Light amber	73	1.12	Good	Excellent	



Oven storage tests







Applications

Several Life Essence Combatox food-grade antioxidants are recommended for each product in the following application guide. This is due to the vast differences in existing regulations in various countries



Frying oils	Ghee	Margarine	Shortening	Bakery fats
Combatox 24A	Combatox 24	Combatox 24	Combatox 24	Combatox 40
Combatox 24	Combatox 24A	Combatox 24A	Combatox 24A	Combatox 40B
Combatox NR	Combatox 40	Combatox 40	Combatox 40B	Combatox 30
	Combatox 40B	Combatox 40B		Combatox NR
	Combatox NR	Combatox NR		

Hydrogentaed edible fats	Chewing gum	Flavors	Spices/sauces	Cheese fat
Combatox 30	Combatox 40B	Combatox 40B	Combatox 40B	Combatox 40
Combatox 24	Combatox 40			Combatox 40B

Meat products	Mineral oil	Fish products	Animal feed	Cosmetics
Combatox 40B	Combatox 40B	Combatox 24	Combatox 24	Combatox 40
Combatox 40	Combatox 40	Combatox 30	Combatox 30	Combatox 40B
Combatox 24				

