



GreenGard™ TBO

TRIETHYL CITRATE, BENZOIC ACID, CAPRYLYL GLYCOL

PRODUCT DESCRIPTION

GreenGard™ TBO is a broad spectrum antimicrobial blend. It is highly effective against Gram (+) & (-) bacteria, and is effective against yeast and mold. Its versatile, liquid form makes it easy to use in all product categories.

KEY BENEFITS—

- Cost effective
- Free from parabens, formaldehyde releasers, phenoxyethanol
- Reliable preservation
- Low impact on stability

PRODUCT FUNCTION

Triethyl citrate is a functional solvent for preservation blends. It is combined with caprylyl glycol, a multifunctional wetting agent, and the well-known preservative benzoic acid to create **GreenGard TBO**. GreenGard TBO is suitable for fragrance-free formulas and allows you to work without Phenoxyethanol without compromising the biological stability of the products.

FORMULATING TIPS

- Can be combined easily with other organic acids if needed
- Effective performance is given at pH range 4-6
- Can be incorporated into hot or cold process formulations

HOW TO USE—

FORMULATING GUIDELINES

RECOMMENDED

Use Level	1.0 - 2.0%
Appearance	Clear Colorless to Yellow Liquid
Procedure	Add into water phase.

GreenGard™ TBO Microbiology Challenge

Testing Report Emulsion System Challenge

GreenGard™ TBO had its preservation properties tested in an O/W emulsion (1.3% usage rate, formulation pH of 5.13). A 28-day European Pharmacopoeia test was performed, in which the formula was challenge tested against Gram (+) & Gram (-) bacteria, yeast and mold inoculations.

Microbial species used for the challenge testing listed below:

Gram (+): *S. aureus*

Gram (-): *P. aeruginosa*, *E. coli*

Yeast: *C. albicans*

Mold: *A. brasiliensis*

Results:

The formula showed a 99.99% reduction in cfu/g within 2 days of inoculation for the Gram (+) & (-) bacterial species, and after 7 days for the yeast and mold species. Reduction was maintained for the remainder of the trial.

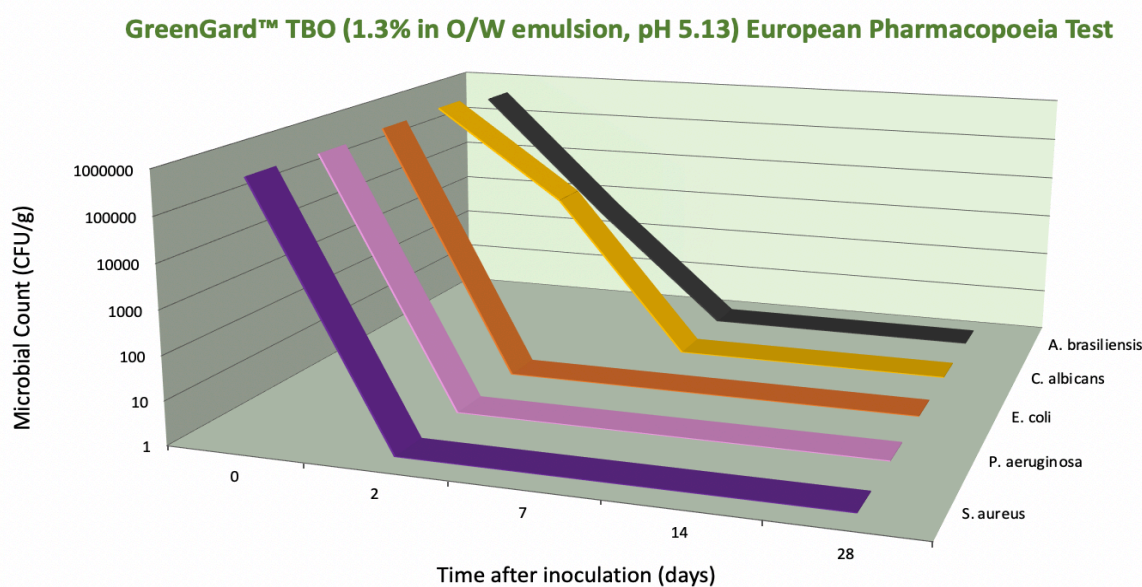


Figure 1 - GreenGard™ TBO reduction of cfu/g against bacteria, yeast and mold in an emulsion system. Total kill was observed for bacteria species after 2 days, and for yeast and mold species after 7 days. Reductions maintained for remainder of trial.

Conclusion:

GreenGard™ TBO, when used at 1.30% in an O/W emulsion between pH 5.0 - 5.50, is a broad-spectrum, germicidal preservative. It is highly effective against Gram (+) & (-) bacteria, and effective against yeast and mold.