

# IMPROVED PERFORMANCE OF VOLATILE BIOCIDES AND PESTICIDES WITH WACKER CYCLODEXTRINS

Biocides and pesticides are often used in the medical, agricultural, household and industrial sectors. Both synthetic and naturally occurring substances can be volatile, which limits their range of use or makes it necessary to apply them several times. Adding WACKER cyclodextrins to a formulation may increase its useful life, while reducing the frequency of its application. This gives formulators more options and an advantage in the marketplace.

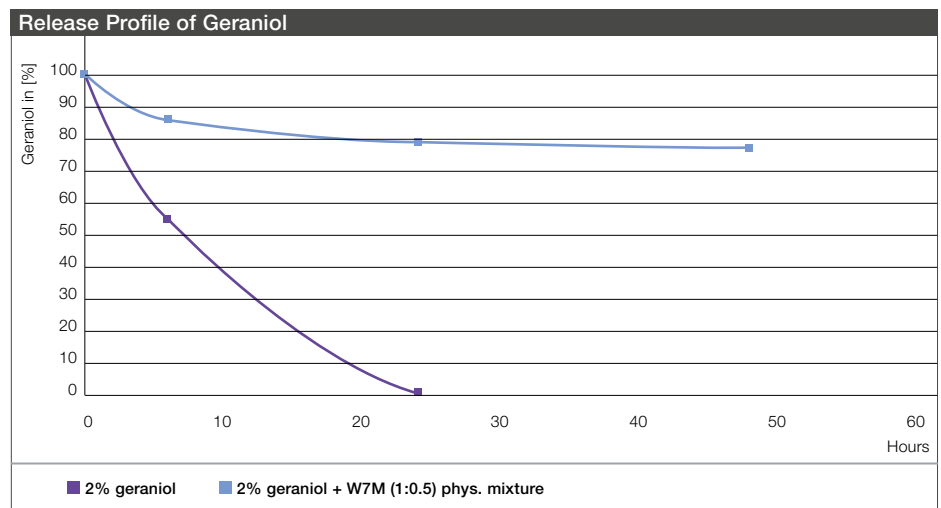
## Background

The efficacy of biocides or pesticides is dependent on the amount of active provided at the target site. Some actives have a high vapor pressure, which causes rapid evaporation, resulting in unnecessary waste.

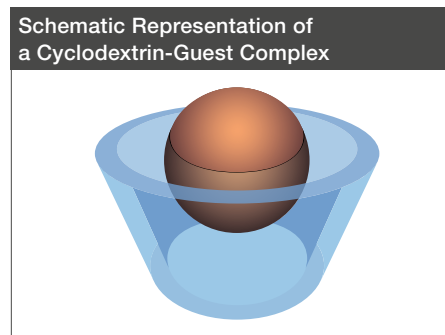
## Encapsulation with WACKER Cyclodextrins

CAVAMAX® and CAVASOL® cyclodextrins are a well-known group of natural carbohydrates which, in water, can encapsulate organic molecules in a reversible equilibrium-controlled process. This 'molecular encapsulation' effectively modifies the properties of the organic guest molecules, e.g. reducing their volatility, extending the release over time, improving stability and water solubility.

## WACKER Cyclodextrins Can Reduce Unnecessary Product Loss Due to Volatile Actives



Two samples of 2 ml of water-ethanol based formulations with a content of 2% geraniol were kept at 40 °C for several days. The formulation with CAVASOL® W7M shows a significantly delayed release.



WACKER cyclodextrins form complexes with lipophilic actives that can improve their product characteristics.

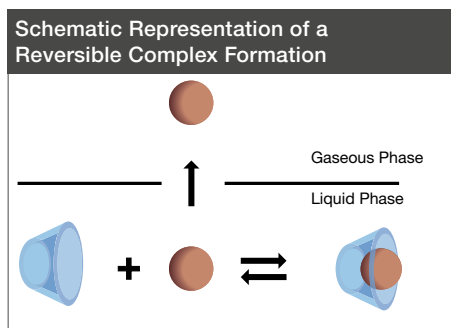
## Advantages of WACKER Cyclodextrins at a Glance

WACKER CAVASOL® cyclodextrins

- Improve the water solubility of organic actives
- Enable access to water-based formulations
- Enhance biological efficacy
- Reduce evaporation, which can help to either prolong the biological effect or reduce the concentration of active

**Improved Product Retention**

Some biocides and pesticides have a very high vapor pressure, which causes rapid evaporation of the active from the target site. There are several methods to reduce evaporation. One effective and economic option is the use of cyclodextrins, sometimes at very low ratios.



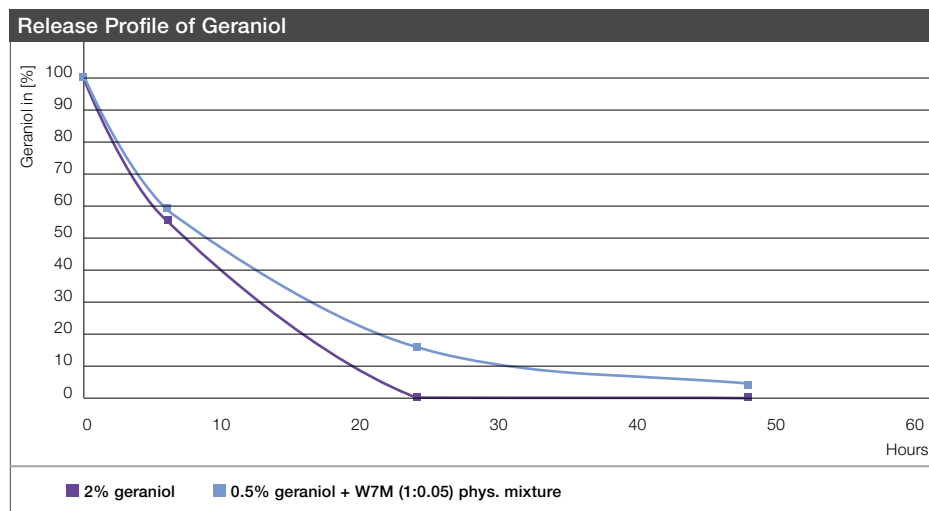
Added as an inert ingredient to formulations, cyclodextrins form reversible complexes with all lipophilic formulation components. The effect is a delayed release of volatile material from the liquid into the gas phase.

**Versatile Formulations**

**Achieve Extended Efficacy without Changing Your Formulation**

The combination of WACKER cyclodextrins with volatile actives makes longer-lasting formulations possible without increasing the amount of active ingredient.

This concept is suitable for substances with limited performance due to their high volatility. Some of these actives would still be useful in terms of other criteria such as price, toxicology or environmental behavior. WACKER cyclodextrins can overcome these limitations to make formulations with these actives feasible.



A sample based on 0.5% geraniol in combination with CAVASOL® W7M shows a more extended release than that with 2% pure geraniol.

**Maintain Current Efficacy with Less Active Ingredient**

The combination of WACKER cyclodextrins with volatile actives allows reduced active-ingredient content while maintaining the same efficacy rate of your formulation.

This concept is useful for substances of high value or for those which cannot be applied in reasonable concentrations due to their environmental impact.

WACKER cyclodextrins are a versatile tool for improving pesticide and biocide product formulations.