

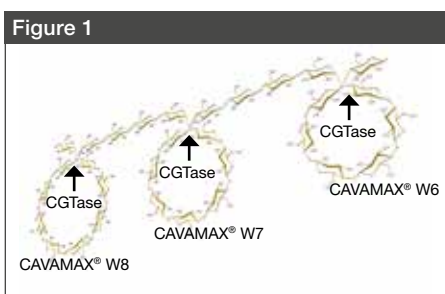
# MASKING TASTES AND ODORS WITH CAVAMAX® CYCLODEXTRINS

The functional food market is booming: Because consumers are living with more awareness of their health, more and more foods are being supplemented with healthy additional ingredients. However, many of these ingredients have an unpleasant taste or smell. CAVAMAX® cyclodextrins can solve this problem.

The trend is going towards foods which not only taste good, but are also beneficial to our health by making our bodies more resistant to environmental influences, by preventing certain illnesses or by slowing down the ageing process. There is a particularly high number of new product developments with additional functional benefits in the beverage and dairy product sectors. Unfortunately, this additional functionality often goes hand in hand with a bitter taste or an unpleasant smell. Often, the only way to solve this problem has been to cover the unpleasant taste: Either by adding sugar, which increases the amount of calories, or by adding other flavors which drives formulation costs upwards.

### A Perfect Solution: CAVAMAX®

With CAVAMAX® cyclodextrins, WACKER offers an excellent solution for this problem. The ring-shaped molecules can bind certain bitter materials or flavors in their insides and therefore stop them being perceived by the senses of taste and odor. Cyclodextrins have a donut-shaped threedimensional structure. Their inside is hydrophobic and their outside is hydrophilic. The inner cavity attracts lipophilic molecules, their hydrophilic exterior



WACKER is the only producer of the three types of Cyclodextrins. They differ in their inner diameters depending on their size of 6, 7 or 8 sugar molecules.

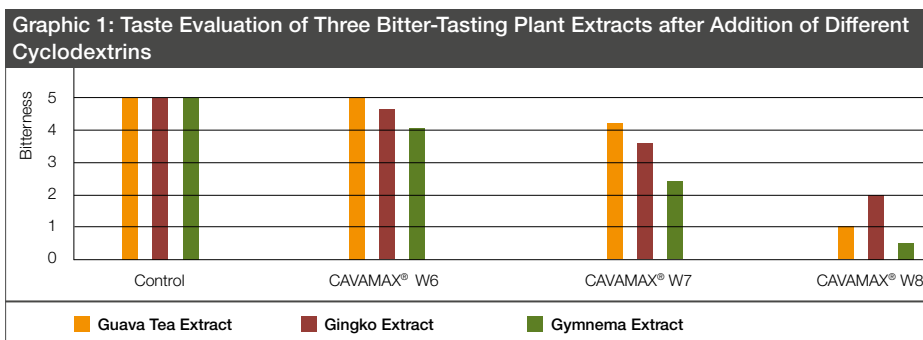


Schematic representation of a CAVAMAX® guest complex.

makes them suitable for formulations in aqueous systems, e.g. beverages. Formulation with CAVAMAX® cyclodextrins does not change the nutritional value or functionality of the ingredient. For the substance being able to fit into the cavity, at least a part of the substance or all of it must be hydrophobic and fit into the inside with regard to its dimensions (see figure 2). However, it is also possible to mask more hydrophilic molecules such as for example catechins.

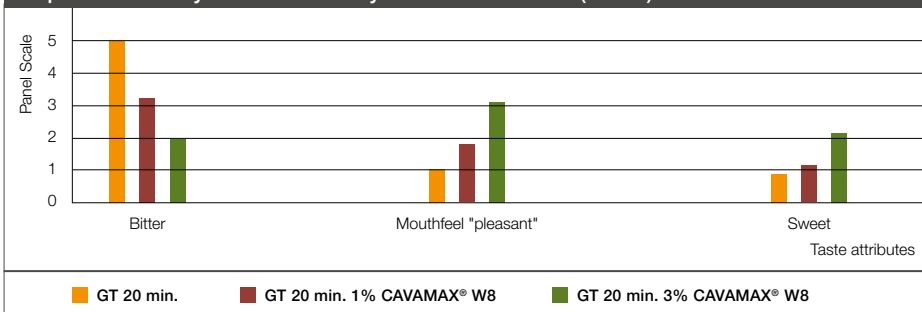
### For a Variety of Applications

A large variety of unpleasant-tasting ingredients, that are regularly formulated into food or beverages, can be masked by cyclodextrins. For example, green tea catechins or plant extracts in beverages or ginsenosides in dietary supplements (see graphics 1, 2 and 3). Masking unpleasant odors is also possible and is not restricted to food products. The odor of many materials can be "improved", for example the smell of garlic, onion or valerian root (see graphic 4).



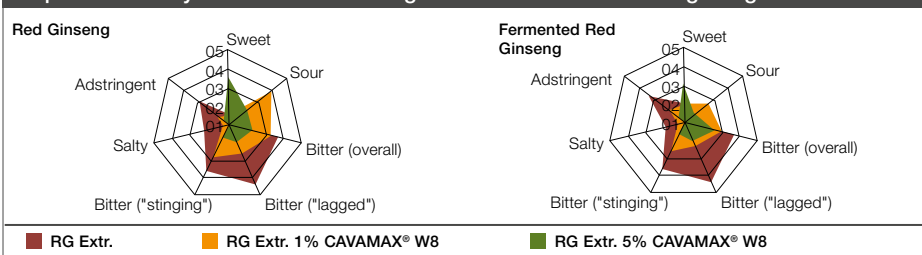
100mg of plant extract (Guava tea extract, Ginkgo extract and Gymnema extract) were mixed with 100mg of CAVAMAX® cyclodextrin (control: starch) in 100ml of water and stirred for 1 hour. The results show that the bitter taste can be masked, particularly by the addition of CAVAMAX® W8 (gamma-dextrin). Scale: 1 = not detectable to 5 = very unpleasant.

**Graphic 2: Sensory Profile of Freshly Brewed Green Tea (20min) with CAVAMAX® W8**



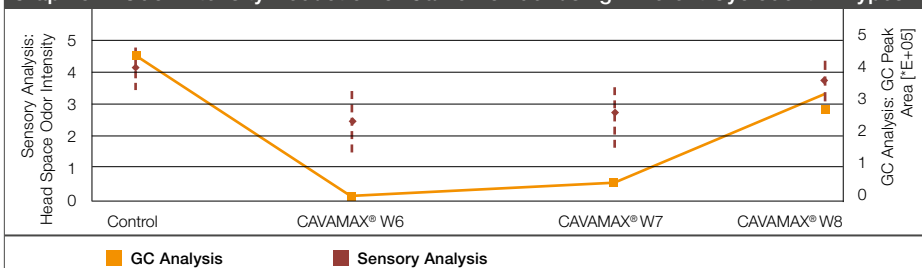
A standard green teabag (GT) was left to brew for 20 minutes. Subsequently, the bag was removed and various concentrations (1 and 3%) of CAVAMAX® W8 were added. The addition of CAVAMAX® W8 reduces the bitterness of the green tea and improves the mouthfeel. Scale: 1 = not detectable to 5 = very unpleasant.

**Graphic 3: Sensory Profile of Red Ginseng and Fermented Red Ginseng using CAVAMAX® W8**



Red ginseng extract (5.5g/100ml; corresponds to approx. 60mg ginsenosides Rg1 + Rb1) was dissolved in water and various concentrations of CAVAMAX® W8 were added. The unpleasant taste can already be masked efficiently by addition of 1% CAVAMAX® W8, but the effect is more pronounced at a concentration of 5%. Scale: 1 = not detectable to 5 = very unpleasant.

**Graphic 4: Odor Intensity Reduction of Garlic Powder using Different Cyclodextrin Types**



1g of garlic powder was equilibrated over night in a 100ml glass jar. Afterwards, 1g each of CAVAMAX® W6, CAVAMAX® W7 and CAVAMAX® W8 (control: starch) was added to 10ml of water, respectively. The sensory and gas chromatographic analysis (=GC) took place after 1 hour. CAVAMAX® W6 was shown to reduce the odor intensity of garlic most efficiently. Scale: 5 = strong, 1 = weak

**A Simple Procedure**

The procedure of masking taste with cyclodextrins is very simple. The product to be masked is dissolved in water together with CAVAMAX® W8. For off-tastes caused by non-protein-based substances, we recommend a starting ratio of CAVAMAX® W8: product powder = 1:1 (w/w%, solids). The obtained aqueous solution needs to be stirred for a short while only and can then be tasted immediately. If there is a perceptible masking effect, the ratio needs to be adjusted according to the desired product specifications.

**Proven Solutions**

Some of our masking solutions have already been launched in the beverage and dietary supplement industry. Particularly in non-alcoholic beverages based on green tea, WACKER cyclodextrins are used to mask the taste of catechin (see example below).



Catechin-rich green tea by ITO EN is a non-alcoholic beverage. WACKER cyclodextrins are used to mask the bitter taste of catechin.



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