

Factsheet: Detection of *Clavibacter michiganensis* subsp. *michiganensis* (Cmm) in water

Currently, there is no specific, reliable test method and threshold value available for Cmm detection in water. Therefore, GSPP relies on a CFU (Colony Forming Units) test that detects general environmental bacteria, with a threshold of < 1500 total CFU/ml as a measure of general contamination of water without the specific aim of detecting Cmm.

Naktuinbouw (the Netherlands) has conducted a pilot to test water contaminated with Cmm at low concentrations. They concluded that at low concentrations, Cmm may be masked by antagonists. *Naktuinbouw* also concluded that Cmm contamination might not be detected at the concentrations at which Cmm is able to cause disease (they regard a concentration of e.g. 50 CFU/ml Cmm as heavy contamination). It is likely that their conclusions are correct.

GSPP has made the following assumptions:

- Cmm is difficult or impossible to detect in water at a low but biologically relevant concentration, before infection in the production is seen, or when there is another source that is contaminating the water. GSPP assumes that Cmm in water cannot be detected at a sufficiently low concentration to be considered safe for the crop.
- For that reason, GSPP does not look for the presence of Cmm, but for the presence of a general contamination of water used for irrigation. General contamination is defined as the total bacterial contamination in the water.
- GSPP wants to guarantee that measures taken to obtain clean water (water that is free of Cmm) are effective and, for that reason, the presence of bacteria in general is tested. When bacteria are present in large numbers in the water, the test shows that there is contamination or that disinfection treatments are ineffective, even without the presence of Cmm in the water or environment, and that additional measures are needed to ensure an effective 'red lock' that prevents the potential introduction of Cmm.
 - Surface water cannot be used without disinfection and the total bacteria test may show that the disinfection treatment is effective, also when there is no Cmm present in the water at detectable levels. (This shows that the 'red lock' is working, and will protect the location when there is Cmm present in the 'red area').
 - Recirculated water must be disinfected and may be used at a total bacteria concentration below 1500 CFU/ml after it has passed a disinfection unit as a maximum tolerable concentration. A test before and after the disinfection unit will show a significant reduction in bacteria concentration when the disinfection unit is operating effectively.
 - Well or potable water may be used at a concentration below 1500 CFU/ml without requiring extra disinfection.

The threshold of <1500 CFU/ml was set based on the results of a survey of historical water test data carried out by GSPP at seed producers, seed companies and young plant raisers. This threshold appeared to be a concentration that was achievable given current disinfection units. For well water, which has low levels of bacteria in general, there is no adequate means of effectively showing a reduction in bacteria after disinfection and, therefore, only the <1500 CFU/ml threshold is used.