OXYBOM™

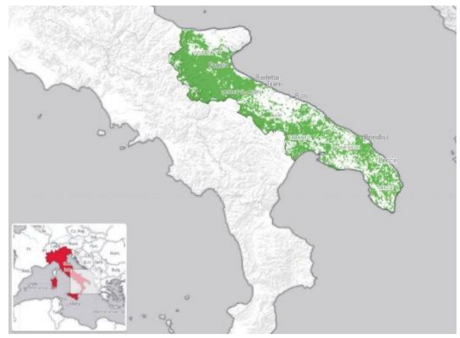
Next Level Chemistry

Olive Disease Treatment

Problem:

Olive groves in Italy are decimated by a disease known as *Xylella fastidiosa.* The bacterium is gram-negative and responsible for destroying many of the groves in the Puglia region. The vector/transmitter is the *Spittlebug* (Philaenus spumarius).

Infected Olive Trees



Infected Region of Italy

Spittlebug

Challenge:

The microorganisms of this gram-negative bacterium has 4 layers in its cell wall that protects it from external forces – *this makes it harder to kill and easier to heal.* It is necessary to penetrate the four layers to attack the nucleus (brains). The outer coat is composed of lipopolysaccharide (LPS). LPS offers some protection from the toxic effects of exogenousagents. This capacity enables the bacterium to survive in hostile environments.

LPS present a physical/chemical barrier through which exogenous $^1O_2$ must pass to interact with vital targets. Primarily, LPS repels $^1O_2$ but some does penetrate this layer and becomes trapped among the unsaturated fatty acids and protein components wherein peroxidation will occur. All things not being equal, some strains fail to produce a significant LPS layer which increases their sensitivity to exogenous $^1O_2$. Most gram-positive bacteria have a bi-layer membrane with an outer coat of *peptidoglycan* (PG), which with greater frequency, allows substantially more $^1O_2$ to pass through than LPS. For both types of bacteria, when $^1O_2$ traverses the membrane layers, any number of enzyme/protein deactivation reactions can occur. When enough enter within a bacterium, more than can be countered…death is certain.

Treatment:

By using OXYBOM™ to irrigate the root system and spray the tree branches and leaves, we can increase the oxidative energy going to the tree. The toxicity of $^1O_2$ is hence dependent on the number of molecules attacking a bacterium. Calculations have concluded that to achieve a 99% kill, 1.3 x 10-5 mol of singlet oxygen should reach a bacterium in 20 minutes. On average, gram-negative bacterium requires 5×10^9 molecules $^1O_2$ per cell.

When oxygen and its by-products overwhelm a bacterium, the following sequence of events takes place:

1. *Oxidation of scavengers*
2. *Peroxidation/disruption of membrane layers*
3. *Oxidation of thiol groups*
4. *Enzyme inhibition*
5. *Oxidation of nucleotides*
6. *Impaired energy production*
7. *Disruption of protein synthesis*
8. *Cell death*

Another thing to note about how OXYBOM™ successfully treats the olive bacterium has to do with the vector/transmitter. A good analogy would be an airplane filled with ammunition. If the ammunition is removed, the airplane becomes a harmless form of transportation. Our proprietary chemical destroys the bacteria inside of the vector such as the Spittlebug. This prevents the insect from spreading disease and it becomes a harmless fly, if it isn't killed during treatment.

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