

A New Natural Pesticide for the Control of Destructive Mussels

Product Description

Zequanox™ is a patented, natural, biodegradable product used to control two invasive mussel species—quagga and zebra. Highly specific and deadly only to these organisms, Zequanox was derived from a ubiquitous, naturally occurring soil micro-organism. Zequanox has been proven to be of minimal risk for native, non-target species and to humans.

Features and Benefits

Environmentally Friendly	<ul style="list-style-type: none"> ✓ Usable without special permits ✓ Non-toxic to native aquatic life and fish ✓ Minimal use restrictions
Proven Effective	<ul style="list-style-type: none"> ✓ Reliably kills quagga and zebra mussels ✓ Known dosage and treatment duration ✓ Effective at all organism life stages
Simple Administration	<ul style="list-style-type: none"> ✓ Short treatment duration ✓ Non-disruptive to facility operations
Cost Effective	<ul style="list-style-type: none"> ✓ No up-front capital costs or long-term power costs ✓ Compatible with existing equipment ✓ Non-corrosive, non-damaging to equipment ✓ Predictable results

General Application Description

Zequanox Reactive is the technical solution to a massive infestation of settled, adult mussels. Used to treat the quagga and zebra mussels (*Dreissena polymorpha*, *Dreissena bugensis*, respectively) that began infesting U.S. waters in the 1980s, Zequanox is a “green” treatment that controls these invasive and destructive pests.

Although phytoplankton is mussels’ preferred food, they will filter and consume bacteria. Zebra and quagga mussels recognize the dead bacterial cells contained in Zequanox as a food source. Consumption of Zequanox destroys the mussel’s digestive system.

Existing commercial products to treat invasive mussels are hazardous, detrimental to aquatic life, and applied with many restrictions. Further, biocides, like chlorine, cause mussels to quickly shut their valves, sensing an adverse effect. This necessitates a prolonged and continuous treatment period that can be three weeks or more. Unlike chlorine and other molluscicides, the mussels consume Zequanox, making this all natural product the perfect biocontrol agent.

After assessing facility conditions, MBI scientists develop a customized program to control your mussel infestation. Zequanox Reactive can be an end of summer treatment or an initial treatment solution for mussel infestation or established populations. The Zequanox Reactive treatment requires the highest concentration for a longer period of time than the Zequanox Protective treatment of juvenile mussels. Treatment duration is a comparatively short 6 to 9 hours. A Zequanox Reactive treatment will result in a steady stream of shell debris over a 3 to 4 week period. If shell debris is a concern, we often recommend modified Zequanox Reactive be followed by Zequanox Protective treatments, where shell debris is not as heavy.

Supporting Data

Zequanox is a new, all natural pesticide derived from a specific strain of the benign microorganism *Pseudomonas fluorescens* (Pf-CL145A). Discovered and patented by a research team led by Dan Molloy at the New York State Museum (NYSM), this ubiquitous species of soil microbe is found at the roots of a common aquatic plant. The Zequanox formulation comprises dead cells that are not genetically modified.

The *Pseudomonas fluorescens* strain is highly lethal to two subspecies of invasive mussels, producing >90% adult mussel kill and 100% larval kill in laboratory studies. Mussels consume Pf-CL145A as a food source and compounds within the cells disrupt the target mussel's digestive system. Ecotoxicological studies have confirmed that Zequanox meets the lowest risk categorization for nontarget aquatic organisms including native mussel species and fish. Toxicity testing of Zequanox also demonstrates that the product is of minimal risk to humans.

Zequanox is significantly less restrictive to other molluscicides on the market today.

For more information on Zequanox contact:
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Marrone Bio Innovations holds four patents for Zequanox. Marrone Bio Innovations, Inc. (MBI) discovers, develops, and markets natural products for pest, weed, and plant disease management. MBI was founded by experienced entrepreneur Pam Marrone, PhD who has successfully discovered, developed, and launched several microbial pesticide products. The company screens microbial strains for their pesticidal properties and also licenses technology and products for exclusive development and commercialization. MBI has a team of experienced scientists – microbiologists, natural product chemists, and agricultural scientists.



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