UPI - Aquatics

• Industry Leader
• Time-tested and Trusted Products
• Strong Commitment:
  • Product Stewardship
  • Research and Development
  • Sustainable Aquatic Plant Mgmt Programs
UPI Aquatics Team

• Gerald Adrian – Aquatics Business Mgr.
  – Jacob Meganck – Territory Manager N.E.
  – Dale Carpenter – T.M. Pacific N.W.
  – Dr. Joe Vassios – T.M. CA, S.W.
  – Jeremy Slade – T.M. FL, Gulf States
  – Craig Smith – T.M. FL, Mid-Atlantic States
  – Dr. Cody Grey – Field Development – Aquatics – Colorado Springs
UPI – Aquatic Products

• Aquathol K
• Aquathol Super K
• Hydrothol 191
• Hydrothol Granular
• Current – Copper; Ethylenediamine (EDA) Herbicide
• Symmetry NXG – Copper; Triethyleamine (TEA) Algaecide
Endothall Formulations

• Aquathol K (Cascade)
  – 40.3% Dipotassium Salt

• Aquathol Super K
  – 63.0% Dipotassium Salt

• Hydrothol 191 (Teton)
  – 53.0% Mono(N,N-dimethylalkylamine) Salt

• Hydrothol 191 Granular
  – 11.2% Mono(N,N-dimethylalkylamine) Salt
Active Ingredient Endothall

• Registered for aquatic use in 1958
• EPA Reregistration Eligibility Decision (RED) in 2005
• Labeled for irrigation canals in 2009
  – 50 years later......new use pattern
• Revision of all labels in 2011
Endothall Chemistry

- Aquatic half-life is 2-14 days
- Breaks down in water by microbial degradation
  - Temperature
  - Plant Biomass
- Degrades into organic acids (i.e., acetic & maleic) used in Krebs cycle, water, and CO₂

[Diagram showing the chemical structures of Endothall, Acetic acid, and Maleic acid]
Endothall Mode of Action

• Products works in a variety of ways:
  – Inhibition of lipid and protein synthesis
  – Inhibitory effects on mRNA synthesis
  – Increased leakage of cellular membranes
  – Inhibitory uncoupler

• Typical symptoms included stem defoliation, waterlogging, loss of photosynthesis and root structure
Endothall Labels

• No swimming, fishing or irrigation restrictions
• No reference to “domestic uses”
• Use designations:
  – Quiescent and slow moving
  – Flowing water systems
• Potable water setback (600 ft)
• PPE Awareness
# Endothall Restrictions

## Environmental Safety Restrictions

<table>
<thead>
<tr>
<th></th>
<th>Aquathol K</th>
<th>Aquathol Super K</th>
<th>Hydrothol 191</th>
<th>Hydrothol G</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quiescent Water</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation *</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Swimming</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Fishing</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Animal Consumption</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Flowing Water</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation *</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Swimming</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Fishing</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Animal Consumption</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

* See label for specific instructions regarding Irrigation Restrictions
## Endothall PPE

### Personal Protective Equipment

<table>
<thead>
<tr>
<th></th>
<th>Aquathol K</th>
<th>Aquathol Super K</th>
<th>Hydrothol 191</th>
<th>Hydrothol G</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mixers / Loaders / Handlers / Surface - Applications</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coveralls over L.S. Shirt and Long Pants</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Chemical-Resistant Headgear</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Chemical-Resistant Footgear</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Chemical-Resistant Apron</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Long Sleeve Shirt</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Long Pants</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Shoes and Socks</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Chemical-Resistant Gloves</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Protective Eyewear</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>NIOSH-Approved Respirator</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Sub-Surface Applications

| NIOSH-Approved Respirator | No | No | No | No |
Copper Formulations

• Current (31.3% CSP)
  – Copper sulfate pentahydrate (CSP)
  – 8% elemental copper
  – Herbicide

• Symmetry NXG (26.5% CTC)
  – Copper Triethanolamine Complex (CTC)
  – 8% elemental copper
  – Algicide
Copper Mode of Action

• Not defined by WSSA

• Symptoms
  – Cells become white or brown
  – Plant tips appear “burned”
  – Plants and algae generally break-up, sink and decompose

• Things to note: water hardness (“soft”), pH (low) and temperature (cool)
Copper Restrictions and PPE

• Restrictions
  – None; Swimming, Fishing, Irrigation, Livestock Watering or Potable Water Use

• Personal Protective Equipment
  – Long-sleeve shirt and long pants
  – Shoes and socks
  – Chemical resistant gloves
Controlling Aquatic Weeds and Algae in Small Lakes and Ponds

Aquathol K and Hydrothol 191
Concentration-Exposure Time (CET)

- Good Control
- Poor Control
- >90% Control Thresholds

Herbicide Concentration

Spot Granules

Liquid Drip

Hours  Exposure Time  Days
Aquathol K and Super K

Weeds Controlled:

Hydrilla (*Hydrilla*)
Coontail (*Ceratophyllum*)
Pondweeds (*Potamogeton*)
Horned Pondweed (*Zannichellia*)
Naiad (*Najas*)
Water Stargrass (*Heteranthera*)
Milfoils (*Myriophyllum*)
Aquathol CET in Ponds

**Spot Treatments:**
- Must use higher rates to achieve CET
- Product usually dilutes throughout the waterbody in 12-24 hours
- Aquathol Super K for contact time

**Whole Pond Treatments:**
- Highly effective even at low rates (1 ppm)
- Limited inflow
Aquathol Treatment Area Considerations

• Treatment plots requiring higher rate:
  • Small areas < 5 acres
  • Narrow strips < 300 ft
  • Relatively high water exchange

• Treatment plots where lower rates may be used:
  • Large treatment areas
  • Wide areas not vulnerable to dilution
1 acre = 832 feet of edge

9000x50 ft = 413 acres
400 ft wide = 10.3 acres
200 ft wide = 41.3 acres

400x800 ft = 7.3 acres
328 feet of edge/acre

227 feet of edge
1757 feet of edge/acre
900 feet of edge/acre

445 feet of edge
Aquathol Applications

Treat heaviest weed infestations
Littoral zone or perimeter
Rate of approx. 1.0 ppm lake or pond-wide
Aquathol - Benefits

• Relatively short contact time required for control of nuisance aquatic weeds 24-72 hrs
• No restrictions on irrigation, fishing, or swimming
• No toxicity to fish or wildlife
• Can be used in combination with other aquatic herbicides and algaecides

Caution: Dissolved oxygen (D.O.) issues can occur when water temperatures are warm and weed coverage is dense
Algae and Weeds Controlled by Hydrothol 191

Algae
Planktonic, Filamentous and Branched

Weeds:
Milfoil       Horned Pondweed       Elodea
Pondweeds     Naiad                Hydrilla
Coontail      Water Stargrass      Cabomba*
Hygrophila*

*Suppression
Hydrothol 191 and Granular

- Broad Spectrum for Weeds and Algae
- Relatively short contract time required for control of nuisance aquatic weeds 12-24 hrs
- No restrictions on irrigation, fishing, or swimming
- Can be used in combination with other aquatic herbicides and algaecides
- Toxic to fish at rates > 0.3 ppm

Caution: Dissolved oxygen (D.O.) issues can occur when water temperatures are warm and weed coverage is dense
Hydrothol 191

• Rates for Algae and Weed Control:
  • Effective at low rates:
    • Algae: 0.10 - 0.30 ppm (foliar or submersed)
    • Weeds: 0.5 - 1.0 ppm  (UNSAFE FOR FISH)
  • May be used in combination with Aquathol K or other aquatic herbicides and algaecides
    • 1 to 1.5 qts = 0.19 to 0.28 ppm
Hydrothol 191 Applications: Algae

- Treat perimeter if needed for filamentous or branched algae
- Whole lake or pond treatment is generally required for planktonic algae
- Do not apply in a manner that rates exceed 0.3 ppm if fish are present
Hydrothol 191 Rates: Algae

Spot Treatments:

• Generally not effective when treating planktonic algae

• Can be made to filamentous algae on lake or pond perimeter

• Typical Rates 0.10-0.30 ppm effective, and are not toxic to fish

• Floating mats can be sprayed with a 3-5% spray solution (0.5 gal product/surface ac). Coverage is Critical!
• Hydrothol 191 & GreenClean Combo
• Mix liquid concentrates
• Depending on algal density, application sequence of granulars is important
Current (Herbicide)

- Weed Species: Elodea, Coontail, Hydrilla, Milfoils, Pondweeds, Naiads, Water lettuce and hyacinth
- Use rates: 0.5 to 1.0 ppm
- Contact times of hours (foliar) and days (submersed) treatments
- Can be used in combination with other herbicides and algaecides
Symmetry NXG (Algaecide)

- Algae Species: filamentous, planktonic and branched
- Use rates: 0.2 to 1.0 ppm
- Contact times of hours (foliar) and days (submersed) treatments
- Can be used in combination with other herbicides and algaecides
“New” Aquatic Species

- Crested Floating Heart
- Hygrophila

- Aquathol K 3 ppm & Hydrothol at 0.3 ppm
- Hydrothol 0.3 ppm & Reward 0.38 ppm
New UPI Products

• Two new products currently under evaluation
  – KFD-94-04
  – KFD-94-05

• Both products have more than one mode of action

• Expected commercially in 2014-2015
Florida Reps

Jeremy Slade
662.617.4571
jeremy.slade@uniphos.com

Craig Smith
561.301.8326
craig.smith@uniphos.com