

Therapeutants in aquaculture

- All aquaculture operations have a demand for drugs, biologics, and other chemicals
- This may include:
 - 1) compounds that one would typically think of as drugs — antibiotics and other therapeutic compounds
 - 2) Disinfectants as part of biosecurity protocols,
 - 3) Fish sedatives and anesthetics
 - 4) Herbicides and pesticides used in pond maintenance,
 - 5) Gender manipulators
 - 6) Spawning aids- hormones
 - 7) Immunostimulants & vaccines as biologics

Pesticides

- Pesticides are applied in aquaculture to control:
- Aquatic Weed - Herbicides
- Parasite - Insecticides
- Fungi –Fungicides
- Pesticides are beneficial chemicals:
 - (1) relatively easy to apply,
 - (2) generally cost-effective and,
 - (3) the only practical method of control in some situations.

Herbicides

- Herbicides often are directly applied to ponds to control:
 - nuisance growths of algae,
 - submersed water grasses,
 - floating water plants and
 - emergent water plants
- 1. **Copper sulfate (Bluestone):** are used to control algae, not rooted aquatic plants.
 - However, copper is a toxic metal that is long-lived (persistent) in the environment.
 - Copper sulfate can be toxic to fish and aquatic animals at concentrations near levels used to control algae, especially in soft water (alkalinity values less than 50 mg/L).

- Copper toxicity increases as water hardness decreases.
- Dose for algal control: 0.5 to 1 mg/L per 100 mg/L total alkalinity (as CaCO₃).

2. Fluridone: perhaps the safest of the registered herbicides to use in fish ponds.

- It is expensive and will not kill algae, but effectively controls submersed aquatic plants. It is a persistent, slow-acting herbicide.
- residue may persist for a period of 2 to 12 months, and results may take 30 to 90 days to be noticeable.
- There are no restrictions for fishing, swimming, or livestock or human consumption.

3. Glyphosate: best used for control of emergent and shoreline weeds.

It is usually applied to the plant and not directly to the water.

It has no waiting period or withdrawal restrictions for irrigation water, livestock water, fish consumption, or swimming.

- Use only those glyphosate products labeled and specially formulated for aquatic systems.
- Some glyphosate products contain additives that are toxic to aquatic organisms.

4. 2,4-D: effective for controlling emergent/floating aquatic plants.

- These compounds rapidly and completely decompose in about 3 weeks.
- Toxicity of these herbicides increases as pH decreases.

They are less effective at pHs greater than 8, and more toxic in acidic waters (pH<6).

5. Diquat: wide-spectrum herbicide that can be used to control algae and submersed weeds, but it is not especially effective on emergent weeds.

- A 14-day waiting period is required by law before diquat treated water can be used for livestock consumption, crop irrigation, or drinking.
- There are no restrictions for fishing, but a 1-day waiting period is required before swimming.
- Diquat is rarely found in treated water after 10 days.

Insecticides

- Insecticides too are directly applied to ponds to control ectoparasitic crustaceans.
- Two main types of agricultural insecticides used today in aquaculture are
- Pyrethroids – Deltamethrin, Cypermethrin etc.
- Organophosphates - dichlorovos, dipterex etc .

Fungicides

- Fungicides, like herbicides, generally are not as highly toxic to fish and aquatic animals as insecticides.
- Trifluralin (Treflan) - Fungicide used in bath treatments in shrimp aquaculture