



## Diquat Dibromide: Benefits to Aquatic Weed Management

Non-native invasive species of aquatic and wetland plants were introduced to waters of the United States as a result of human activities and are causing detrimental effects on irrigation, fishing, swimming, boating, native flora and fauna, as well as declines of indigenous aquatic species and aquatic habitat. Therefore, selective aquatic weed management is critical to sustaining the activities dependent on waters of the United States. The use of Reward® aquatic herbicide can provide significant economic, societal, and environmental benefits due to its unique technical profile and excellent fit within an Integrated Aquatic Weed Management (IAWM) program. Reward is an important tool for aquatic weed control, providing advantages and opportunities for aquatic managers to achieve weed control goals using an environmentally-minded approach.

### ● Benefits

The selective management of aquatic weeds is vital to the protection of water bodies within the United States. The benefits of Reward as an aquatic weed management tool are numerous.

#### 1. Weed control

The technical profile of Reward is key to its success as an aquatic herbicide:

**Rapid Activity** Important in controlling fast-growing and quickly spreading invasive weeds.

**Non-Systemic, Contact Action** Affects only the vegetation it contacts.

**Rainfast** Re-spraying emergent or floating species after rainfall is unnecessary.

**Non-Volatile** Presenting no vapor drift hazard.

**No Residual Activity** Shortly after application, the active ingredient is deactivated and not biologically active to non-target organisms.

**Versatile IAWM Tool** Active on a broad number of invasive species.

**Spectrum of Control** Reward successfully controls over 15 major aquatic weeds, including Eurasian Watermilfoil, Parrot Feather (*Myriophyllum*), Hydrilla, Water Hyacinth, Water Lettuce, Giant Salvinia, and Brazilian Elodea.

#### 2. Beneficial uses of water

Following applications of Reward to control aquatic weeds, water use is as follows:

- Swimming, fishing, and other recreational activities can be resumed without restrictions.
- Minimal restriction on use for livestock consumption (1 day) or drinking water (1–3 days).
- Minimal restriction for irrigation use (1–3 days for turf and ornamentals; 5 days for food crops).

#### 3. Integrated Aquatic Management (IAM)

IAM is a whole lake (or water body) management plan for exotic/invasive species that incorporates environmentally sound, economically viable, and socially acceptable dimensions. By implementing IAM, beneficial uses and wildlife goals are sustained using the latest technology/research and Best Management Practices (BMPs).

Integrated Aquatic Weed Management (IAWM) is a key component of IAM, featuring fundamentals of prevention, observation, and intervention. IAWM provides a basis for efficient and effective management of aquatic systems using an integrated approach.

- Reward can be used as part of an IAWM program with BMPs to reduce weeds to ecologically, economically, and aesthetically acceptable levels as specified by a management plan for the water system.
- Reward can be used in an integrated approach with cultural, mechanical, and biological control methods for long-term weed control. Often, there are distinct advantages and limitations for each method dependent upon the aquatic weed species and the site in question. For example, Reward may be used:
  1. For spot treatment or partial lake treatments while other methods are used elsewhere.
  2. By alternating with other methods to target specific weeds within a season.
  3. At the same time as ongoing programs to control non-weed invasive species as part of IAM.

Herbicides such as Reward are often a good choice in an IAWM program because they provide (Getsinger 1998):

- Predictable efficacy over a defined time period and within a specific target location.
- Selective control of target vegetation.
- Well-characterized and minimal risks with respect to human health, and a favorable environmental profile.
- Cost-effectiveness.

#### 4. Threatened and endangered species

Invasive species can replace native plant species on which wildlife may be dependent for food and shelter. Reward is an important tool for targeted management of critical habitat for endangered species or habitat in proximity to endangered species. The successful properties of Reward are that it:

- Can be applied as a “spot treatment” with little to no off-target movement.
- Works only on the actual vegetation it contacts. It has contact action and does not move from treated vegetation to other areas.
- Loses biological activity on contact with sediment.

Reward has been effectively used to control nuisance vegetation in Florida waters occupied by endangered manatees and also in the California Sacramento Delta, which provides a home for several endangered species, including plants, insects, birds, and fish. In fish hatcheries, diquat has been successfully used experimentally at elevated rates to control a number of diseases, including Bacterial Gill Disease, without adverse effects (U.S. Fish & Wildlife Service 1990, Fish Disease Leaflet 84).

#### 5. Favorable environmental profile

Diquat has been fully evaluated with respect to its safety to applicators, human health, and the environment and was recently re-registered by the United States Environmental Protection Agency. However, Reward must be applied to aquatic systems following specific label use directions. Labeled uses are fully supported by exposure, toxicity, and risk assessments that indicate a favorable environmental profile.

Many aspects of the fate and biological activity of diquat are desirable for aquatic herbicides. Diquat’s high solubility in water and adsorption to aquatic plants ensures that much of the applied product reaches the targeted plant. Because diquat also adsorbs to sediment and suspended particulate matter, it dissipates rapidly from the water column. **The rapid dissipation leads to low persistence of diquat, and therefore little to no exposure to fish, sediment-dwelling organisms, and other non-target species.**

#### ● Environmental fate recap:

- Rapid dissipation in water systems.
- Loss of biological activity on contact with sediment.
- Lack of movement from vicinity of application once adsorbed.
- Very extensive environmental profile database (>20 species of aquatic animals) and favorable environmental assessments.
- Overall, the use of Reward results in substantial benefits to aquatic ecosystems that are adversely impacted by invasive weeds.

#### ● Useful information resources

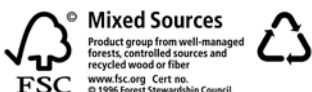
- *ECOfacts* Reward Landscape and Aquatic Herbicide. Syngenta Professional Products.
- Center for Aquatic and Invasive Weeds—University of Florida <http://aquat1.ifas.ufl.edu>
- Council for Agricultural Science and Technology (CAST) Issue Paper No. 13, February 2000. “Invasive Plant Species.”
- K.D. Getsinger, 1998. “Aquatic Weed Control. Appropriate Use of Aquatic Herbicides.” *Land and Water*. July/August issue.
- U.S. EPA Reregistration Eligibility Decision (RED): [www.epa.gov/oppsrrd1/REDs/0288.pdf](http://www.epa.gov/oppsrrd1/REDs/0288.pdf)
- World Health Organization (WHO) Environmental Health Criteria 39. Paraquat and Diquat. [www.inchem.org/documents/ehc/ehc/ehc39.htm](http://www.inchem.org/documents/ehc/ehc/ehc39.htm)
- Aquatic Ecosystem Restoration Foundation [www.aquatics.org](http://www.aquatics.org)

#### Reward is an important IAWM tool

- Environmentally sustainable approach to weed control
- Compatible with other aquatic weed control methods
- **Swimming and fishing can resume without restrictions**
- Can be used in endangered species’ habitat
- Favorable environmental profile

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