Natural Microsponges Coat Underwater Plants to Help Control Hydrilla

(by Janet Beall and Rick Swift, Pinellas County, 22211 US Highway 19 North, Clearwater, Florida 33765; Rick Lowe and L. Marshall, Ph.D. TAPT, 5988 Mid Rivers Mall Drive, Suite 124, Saint Charles, Missouri 63304)

Hydrilla (*Hydrilla verticillata,* Figure 1*)* is an invasive submerged aquatic weed that is known to grow 1-4 inches per day and can clog waterways affecting navigation, fishing, hydroelectric plants, and irrigation[123]. Currently in Texas, it is estimated that there are 100,000 acres of hydrilla[4] in the Rio Grande, Brazos River, Navasota River, Colorado River, Lake Conroe, and other waterways and reservoirs[5] shown on Figure 2.

Fig. 1: Hydrilla verticillata
Picture from University of Florida IFAS

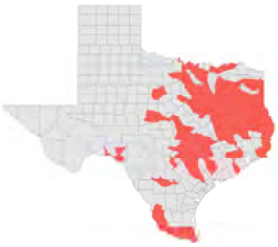

Fig. 2: Map of Hydrilla Infestation in Texas
Map from U.S. Geological Survey

New technology to make aquatic herbicides stick underwater for hydrilla control uses cereal grain derived microsponges found in TopFilm™ adjuvant[6]. Pinellas County in Florida reported using the new microsponge technology to help stick herbicide to hydrilla in submerged aquatic conditions. The advantage of using sticky cereal microsponges is that you can keep the treatment on the plant rather than making it dilute in a lake environment.

In previous aquatic testing of hydrilla, the natural cereal grain based microsponges had the ability absorb active ingredients, such as *Mycoleptodiscus terrestris*[7], a natural bioherbicide, and also had the ability to stick underwater and attach the natural active ingredient to hydrilla[8].

For testing purpose, the concept was to allow the microsponges absorb a standard herbicide in the tank mixture and allow the herbicide stick to the hydrilla (leaves/stems)

---

[1] http://aquat1.ifas.ufl.edu/hydcirc.html
[2] http://www.se-eppc.org/manual/HYVE.html
[3] http://www.galvbayinvasives.org/Guide/Species/HydrillaVerticillata
[4] http://fireant.tamu.edu/antfacts/pdf/texas1.pdf (References to 100,000 Acres of Hydrilla in Texas)
[5] http://nas.er.usgs.gov/taxgroup/plants/docs/hy_verti.html
[6] http://www.Biosorb-Inc.com
[7] Confrancesco, A., Journal of Aquatic Plant Management 36: 49-53 (1998).
[8] Shearer, J., Journal of Aquatic Plant Management 36: 54-56 (1998).

underwater increasing contact between the herbicide and the targeted weed (rather than diluting the herbicide in the waterway).

To test the concept, Pinellas County staff applied various tests in a drainage ditch containing hydrilla that had minimal flow rate. Three separate trials were constructed. All trial areas were measured (Figure 3) by acre-foot. Each trial area was separated by a 25 foot buffer zone. The first area was (75 ft x 22 ft x 2 ft deep), where no herbicides were used called Zone #3 (Figure 4). The second was a herbicide (alone) area (75 ft X 22 ft X 2 ft deep) called Zone #2, which had the same amount of hydrilla density. The third was a herbicide with microsponge tank mix application in area called Zone #1. The trials are summarized as follows:

Zone	Dimensions	Type
#1	75' X 22' X 2' depth	Herbicide & Microsponge
#2	75' X 22' X 2' depth	Herbicide (alone)
#3	75' X 22' X 2' depth	No herbicide - Control

The tests were applied in a standard irrigation/drainage canal in Pinellas County (Tampa/St. Petersburg area of Florida) that had minimal flow, to reduce herbicide spreading.

Fig. 3: Rick Swift Measuring Acre-Foot of Drainage Ditch for Rate of Application Determination

Fig. 4: Hydrilla Check (Untreated) Zone #3

The test was to compare whether the microsponge additive had any effect on improving the herbicide's ability to control hydrilla. The herbicide used during testing was Aquathol K (40.3% dipotassium salt of endothall).

At the start, a 20 foot buffer was set next to a pipe opening in the ditch. Right next to the buffer area, a 75 foot area (Zone #1) was treated with 26 oz of Aquathol K with 0.64 oz of TopFilm™ adjuvant. This rate translates to 4 ppm Aquathol K with 16 oz of TopFilm™ per acre. (Figure 5)

Fig. 5: Hydrilla Treatment Day – Using a Handgun Attached to a Truck Spray System.

Beside the herbicide/microsponge treatment area, another 25 foot buffer zone was set, followed by a 75 foot section (Zone #2) which was treated with 26 oz of Aquathol K alone (no microsponges). This rate translates to 4 ppm Aquathol K (alone).

Finally, another 25 foot buffer zone was set up, which was followed by a 75 foot untreated control area (as a check point) (Zone #3).

The entire treatment area had equal morning shade from trees to the east, equal afternoon sun allowed by an open field to the west, and was uniformly full of Hydrilla (Figure 3).

RESULTS:

The results to determine the density of hydrilla in the waterway were measured visually and with raking since the ditch had a depth of 2 feet. The results are summarized in Figure 5.

Six days after treatment (6 DAT), there were no significant differences between Zones #1, #2, and #3.

Two weeks after treatment (2 WAT), herbicide activity was beginning to show hydrilla control.

Four weeks after treatment (4 WAT), there were significant differences: Zone #3 (the control with no herbicide) was full of hydrilla or 0 % Hydrilla Control; Zone #2 (herbicide alone with no microsponge had hydrilla) had 50 - 60% Hydrilla Control; and Zone #1 (herbicide with microsponge) had no hydrilla, or 90 – 100 % Hydrilla Control.

Six weeks after treatment (6 WAT), the results showed: Zone #3 was still packed with Hydrilla (0 % Hydrilla Control); Zone #2 Hydrilla remained at 50 - 60% Hydrilla Control; and Zone #1 had no hydrilla present (100% Hydrilla Control).

As shown in the picture in Figure 8, there remained a patch of hygrophila (*Hygrophila polysperma*), which is not controlled with the rate of 4 ppm Aquathol K.

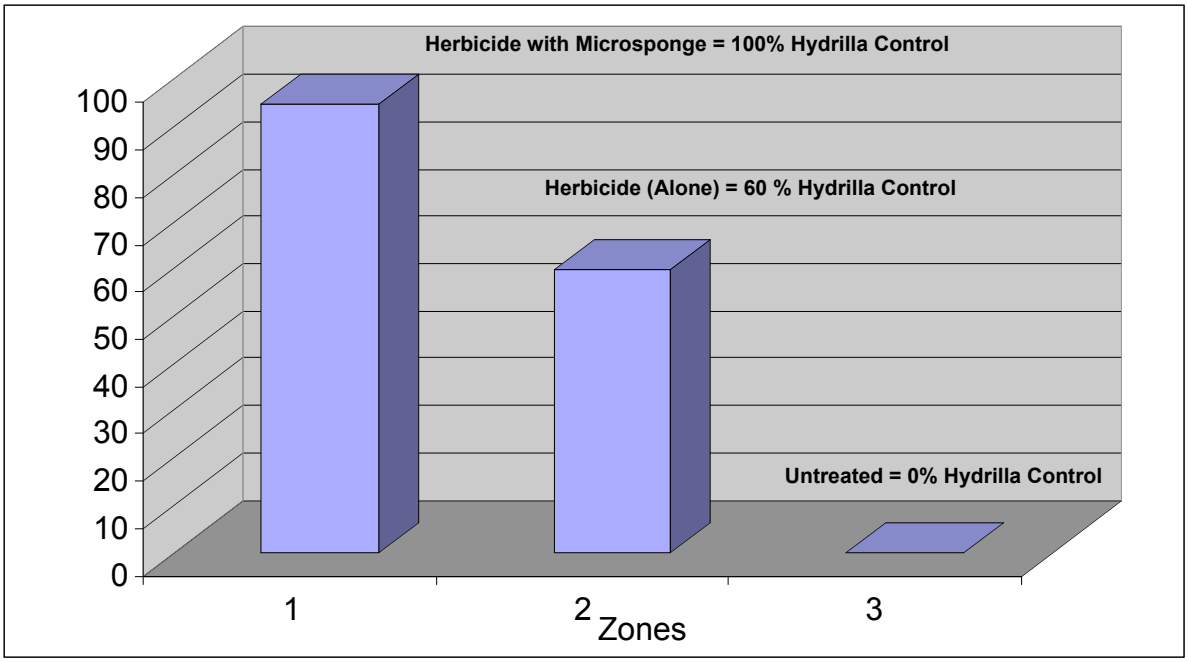

Fig. 6: Results Six Weeks After Treatment (6 WAT) shows the Zone 1 "Herbicide with Microsponges" had 100% Hydrilla Control; Zone 2 "Herbicide Alone" had 60% Hydrilla Control; and Zone 3 "Untreated Control" had 0% Hydrilla Control

A few days later (after 7 weeks of application), during further checking Pinellas County applicators reported "a clear and significant difference between #1, #2, and #3 with almost no regrowth in Zone #1, definite regrowth in Zone #2, and packed [with hydrilla] in Zone #3." (Figure 7)

Fig. 7: Six Weeks After Treatment (Herbicide with Microsponge, Zone #1) shows 90-100% Control of Hydrilla with no regrowth

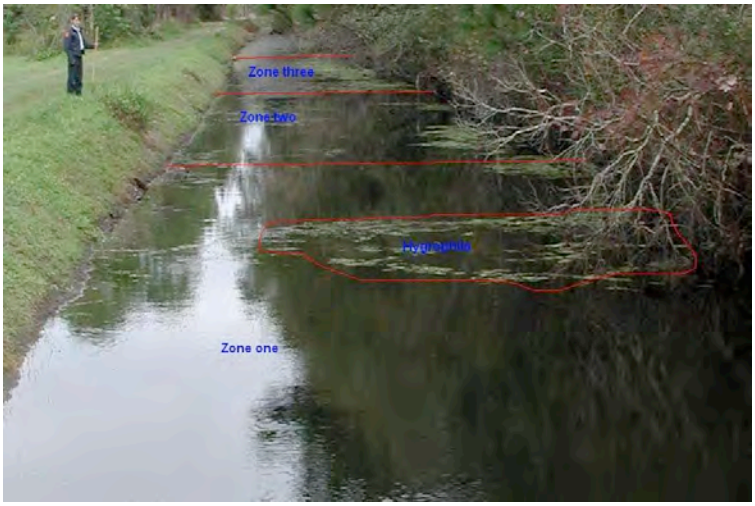

Fig. 8: Summary Picture After Six Weeks (6 WAT) Showing the Treatment Zones and the Hygrophila Patch

This study reported by Pinellas County demonstrates that new microsponge technology of TopFilm™ makes herbicides stick underwater to weeds, reducing the dilution of the chemical in the waterway.

Government agencies and organizations are using new natural-based technologies to help reduce the chemical load on the environment. Water quality is a major issue in several states. According to the EPA, 65% of pollution in rivers and 76% of lakes in the United States is attributed to nonpoint source pollution from run-off of applied treatments[9]. Using the natural microsponge system in TopFilm™ is one approach to reducing the run-off and dilution in waterways.

[9] TNLA Green Magazine, November 2007, pp. 10-14.