

APPENDIX H

Guidance for Deploying Barley Straw

APPENDIX H

GUIDANCE FOR DEPLOYING BARLEY STRAW

Using Barley Straw to Reduce Algal Growth in Wastewater Treatment Pond Systems **Charles E. Corley, Illinois Environmental Protection Agency**

Q: If you are not Anheuser Busch, what does one do with barley?

A: The days of filling a feedbag of a horse-drawn milk wagon being long gone, the sensible use is float it, the straw portion at least, on your pond, ditch, impoundment or reservoir. Why? Well, as some people have found from German Valley to Manchester, Illinois and England respectively, your water will be clearer, cleaner and lower in suspended solids due to algae.

Studied in the UK, the decomposition of barley straw and the observed effects on algae has been recorded since the late 1980's by multiple researchers including Dr. Jonathon Newman, University of Bristol, Department of Agricultural Sciences, Reading, U.K. Over ten year's worth of observations has distinguished "rotting barley straw" as an effective inhibitor of the color and suspended solids attributed to various types of algae. The research was done in "impoundments", slow moving "canals", and many other bodies of water; and has been confirmed by laboratory studies. This has led researchers to propound: "Decomposing barley straw inhibits the growth of both filamentous and blue-green algae species in all types of water bodies so far assessed".¹

What causes barley to be so effective is not truly identified. Again, researchers have analyzed many chemical constituents produced by rotting barley straw.² No one chemical is predominant and the combined effect appears to be the controlling factor. Not the presence of the straw, but the decomposition products appears to provide the effect. Other straws and plant material have been tested and dismissed in preference to barley.³ For example, green plant material like alfalfa and hay impart an organic load on the system while wheat straw, corn and lavender stalks, two quite common Illinois plant materials the latter less so, seem to have poorer effects and longevity. Despite uncertainty of the exact mechanism or product that produces the benefit, a benefit it is. One easily measured and observed, at that.

Transferring the technology, if one can refer to rotting barley straw as technology, to wastewater systems at best would seem a stretch. Newman's own studies indicate that algae growth continues with sufficient nutrient concentrations.⁴ Further, algae and fungi appear to be affected while all other aquatic animal and plant life are not. Nor is dissolved oxygen. Therefore, no detrimental conditions would be expected and, if any benefit accrues in wastewater systems, all would be positive steps.

The application, of this truly natural and beneficial product, to water bodies of all types is fundamentally simple. Bundle it, float it and watch it rot! No need to search for the "right" type of barley straw or the vintage year, if there is one. Contact the nearest, cheapest and most readily available source and have at it. A slight oversimplification perhaps, but the years of observation have demonstrated these few basics. All confirmed by trials in Illinois communities and industries.

What few basic tenets have been displayed in use in Illinois include these: First, the straw must be floating throughout the application period. When allowed to sink, the thought is that it becomes a detrimental organic load. Secondly, since the original uses were in surface water ponds and impoundments and not wastewater systems, repeated applications are necessary from spring thru warm weather. Warm weather and wind action on the surface are two necessary ingredients. Also, keeping the straw loosely packed inside a long open-web material such as common snow fence is ideal and preferred to the more open-weave Christmas wrap where straws can escape.

Success can be found in all corners of our state. From Gardner to Ohio and Sorrento to Hudsonville barley straw decomposition abounds. Measurable and observable benefit without any detrimental environmental effects abound. First used in Gardner at the wastewater pond system, it reduced the use of copper sulfate while improving the effluent suspended solids for weeks in the hottest part of the summer of 2000. The operator at Sorrento experienced similar benefits during the summer of 2002 at the water plant where lower turbidity was demonstrated and fewer applications of copper sulfate were needed. These two have a sided benefit of reduced applications and reduced cost of an admittedly useful but hazardous material, copper sulfate. Other wastewater applications include the ash pond treatment at the Amerens Hudsonville Generating station. Barley straw here reduced the algae count in the effluent along with the suspended solids while positively affecting the pH of the discharge to the Wabash River. Using the straw at Ohio was done late in the summer in 2001. Not expecting a huge margin of success as a result of sludge pockets in all pond cells, the floating barley straw booms were effective in keeping the effluent suspended solids from exceeding the permitted limits for weeks.

These and others stories could be repeated throughout the Illinois with willing participants and experimentation-minded communities.⁵ Who knows, the result might be cleaner, clearer ponds with fewer green discharges to Illinois' surface waters. Better water quality. What a concept!⁶

Materials List and Cost:

Note: An application rate of 20 grams straw/m² is the same as 1oz / sq yd.

Four to five forty-pound bales of barley straw for each acre @ \$5 – \$35

Two 100 ft. rolls of snow fence @ \$20

Two rolls 350 lb test polyethylene rope @ <\$10

Two fence post @ \$1.89

Sixty one-gallon and half-gallon bottles

One tube silicon sealant @ \$2.95

Nylon zip ties @ lowest cost

Two and a half hours on a sunny day.

Supplies and Method:

Flotation: Both gallon and half gallon bottles spaced 5 feet apart

Sealant: Silicon seal the inside of bottle caps

Configuration: Sausage Boom

Size: Two @ 95 ft. in series or parallel (or divide length as needed)

Location: Diagonally, upwind, in mixing pattern

Anchor: Double strands of poly rope tied to posts.

Documentation:

Determine BOD and TSS loading on all cells and compare to the design
Sample early spring, before algae bloom starts or before first application
Sample treated cell influent and effluent TSS weekly
Compare results to same times in previous years

(Send your results to the Illinois EPA Rockford Regional Office or Charles Corley, 815 987-7760.)

¹. Newman, Jonathon R and Barrett, P.R.F.; "Control of Microcystis aeruginosa by Decomposing Barley Straw". 1993, Aquatic Plant Management. 31: 203 - 206

². Newman, Jonathon (1999) "Information Sheet 3 – The Control of Algae Using Straw". Copyright ICAR-Centre for Aquatic Plant Management.

³. ibid

⁴. ibid

⁵. No conflict with the EPA Federal Insecticide Fungicide and Rodenticide Act (FIFRA) would be expected when used in the privacy of one's own non-public water-body or pond; which the above were. In fact, barley straw has been promoted without apparent conflict in the landscape pond industry for decades.

⁶. Further information or a presentation of success stories in Illinois can be obtained from Charles Corley, Rockford Region 815 987-7760 charles.corley@epa.state.il.us or from any Regional office.