

BARLEY STRAW AND ALGAE CONTROL INFORMATION SHEET

* This document is a summary of "Information Sheet 1: Control of Algae with Barley Straw" authored by Professor Barret and Jonathan Newman, published by the Centre for Ecology and Hydrology [1].

Access:

https://www.researchgate.net/publication/233867874_Centre_for_Aquatic_Plant_Management_INFORMATION_SHEET_1_CONTROL_OF_ALGAE_WITH_BARLEY_STRAW

[1] B. Prf and J. Newman, *Centre for Aquatic Plant Management INFORMATION SHEET 1: CONTROL OF ALGAE WITH BARLEY STRAW*. 2012.

Best conditions for the use of barley straw are detailed below.

TEMPERATURE

- Decomposition is temperature dependent
 - **6-8 weeks** for straw to become active when water temperatures are **below 10°C**
 - **1-2 weeks** when the water is above **20°C**.
 - During these periods, algal growth will continue unchecked.

PROLONGED PERIODS OF HOT WEATHER

- Straw should not be applied during prolonged periods of hot weather to waters containing dense algal blooms
- The combined oxygen demand from the algal bloom and the straw could temporarily increase the risk of deoxygenation.

SPEED OF EFFECT

- **Small, unicellular** species which make the water appear green and turbid, usually disappear within **6-8 weeks** of straw application.
- The **larger filamentous algae**, often known as blanket weeds, can survive for longer periods and may not be controlled adequately in the first season if the straw is added too late in the growing season when algal growth is dense.
- **Recommendation:** add the straw very early in the spring or before algal growth starts.

PRODUCTION OF ANTI-ALGAL ACTIVITY

- If the straw is applied:
 - in **large compact masses** such as bales
 - to **very sheltered** and **isolated** areas of water,
- there will be insufficient water movement through the straw and anaerobic conditions will develop.
- Anaerobic decomposition can produce chemicals which actually **stimulate** the growth of algae

TURBIDITY

- Chemicals from barley straw are very quickly absorbed and inactivated in waters which have high algal populations and are turbid with suspended mud.
- **Recommendation:** it is necessary to add at least double the recommended quantities of straw than in clear waters

RECOMMENDED QUANTITIES

STILL WATERS:

- **Initial dose:** rate of straw should be between 25 and 50 grams straw per square metre of water surface (gm^{-2}).
- **Subsequent dose:** rate should be about half the initial rate, or about 25 gm^{-2} .
- **Maintenance dose:** Once the algal problem has been reduced, further additions of straw should be made to prevent a recurrence of the problem. At this stage the dose can be reduced to 10 gm^{-2} .

TURBID/ MUDDY WATERS

- It is necessary to add more straw than in clear, mud-free waters.
- It is better to apply too much initially and then to reduce the quantity gradually each time straw is added until the dose has been reduced to 10 gm^{-2}
- **Recommendation:** excessive amounts of straw can cause problems by deoxygenating the water. Do not apply more than 500 gm^{-2}

HOW TO APPLY:

- Garden Ponds:
 - apply the straw in a loose form retained in some form of netting or cage.
- Large ponds, lakes and reservoirs:
 - larger quantities of straw are needed, bales should be broken up on the bank and the loose straw wrapped in some form of netting or wire.
- Fast flowing rivers and streams:
 - Straw can be applied in the form of small bales (approximately 20kg) because the flow of water will keep oxygen levels high enough to prevent the straw from becoming anaerobic.
 - Bales can break up under the forces produced by fast flowing water and they should normally be wrapped with netting or chicken wire and securely anchored to the bank or posts driven into the river bed.
- Slow flowing rivers.
 - Straw should be applied in a loose form, either in gabions or as straw sausages.

WHERE TO APPLY:

- Placement does not need to be exact.
- If there are any **inflowing streams**, it is advisable to increase the number of nets near the inlet so that water flows through the straw and distributes the chemical into the lake.
- In an **irregularly shaped water** body, the preferred place for some of the nets is opposite any promontories or points where the nets will be exposed to maximum wind and wave action.
- Use several small quantities rather than one large one
- Small ponds
 - Single net of straw placed in the center of the pond.
 - if there is an incoming flow of water, either as a stream or fountain, the straw net should be placed where there is a continuous flow of water over and through the straw.

- Lakes and Reservoirs
 - The anti-algal chemicals will diffuse outwards in all directions from each net of straw gradually being absorbed by algae and inactivated by mud until the concentration becomes too low to be effective.
 - Beyond this distance, algal growth will continue unchecked and these algae will gradually drift back into the treated areas giving the impression that the straw is not working.
 - In order to ensure that there are no areas within the water body unaffected by the straw, it is necessary to calculate how much straw is needed, how many nets should be employed and how far apart each net should be.
 - Nets or sausages of straw should then be placed so that each net is roughly equidistant from its neighbours and from the bank.
 - The steps involved in this calculation are explained below with an example.

Table 1. Method for estimating amount of straw required.

Decision Step	Calculated example
Estimate the surface area of the lake	1.5ha (15,000 m ²)
Decide on the dose rate of straw required.	25 g/m ²
Multiply the area of the lake (in m ²) by the quantity of straw required per m ²	15,000 x 25 = 375,000 g 375,000 ÷ 1000 = 375 kg
To obtain the number of bales needed, divide the total weight of straw by the weight of bales. Weights of bales should be checked.	375 ÷ 20 = 19 small bales
Decide on the weight of straw to be placed in each net. Nets should normally contain between 1kg (in small ponds and lakes) to 40kg (in very large lakes).	25 kg
Calculate the number of nets which will have to be constructed. Divide the total quantity of straw required by the weight in each net.	375 ÷ 25 kg = 15 nets
Calculate the area which will be treated by each net at the dose rate	25kg @ 25g/m ² = 1,000 m ²
Calculate the radius of a circle with an area of the size calculated in 6 (above) using πr^2 .	$\pi r^2 = 1,000$ $r = \sqrt{1,000} \div 3.142$ $r = 17.85 \text{ m}$
The diameter of a circle of 1,000 m ² is $r \times 2$	diameter = 35.7 m
Decide on the most appropriate placement of the nets of straw in the lake so that each one is approximately 35m from its neighbour and 17m from the bank.	Usually a regular square grid pattern with centres at 35 m

WHEN TO APPLY

- Straw should be applied twice each year, preferably in early spring before algal growth starts and in autumn when water temperatures are low
- Can be applied at any time of year, it is much more effective if applied before algal growth begins
- Anti-algal agents released by the straw are more effective in **preventing** algal growth **rather than killing** algae already present
- straw will become active within a month and will continue to inhibit algal growth for about 6 months
- At water temperatures:
 - **above 20°C**, straw has been effective in controlling algal blooms **within 4-5 weeks, sometimes even faster.**
 - At **lower temperatures**, the process is slower and it may take **8 - 10 weeks** to control the algae but the risk of deoxygenation is then minimal. An advantage of lower temperatures is that the straw lasts longer too.

INTEGRATED CONTROL

- Filamentous algae are not easily controlled by straw once they have formed floating mats.
- Can be controlled by other methods
 - Can be raked out. However, many fragments will remain in the water and rapid regrowth is likely.
 - To prevent this straw should be added about one month before the algae is raked
 - Herbicides (diquat or terbutryn) can be used in combination with straw.
 - The herbicides control the algae but their effects may not persist for long once the herbicide has decayed or been otherwise dissipated from the water.
 - By adding straw at the same time, or soon after the herbicide has been applied and maintaining a straw treatment regime as outlined above, the straw helps to prevent the return of the algae.