Aquatic Solutions UK

Breathing New Life Into Your Water Course

Specialists in pond or lake cleaning and refurbishment. Removal, treatment and control of algae, pond and bank weed, silt pumping and dredging.

The Benefits of Barley Straw

Control of Algae Using Barley Straw

Algae cause a number of problems in water. They impede flow in drainage systems, block pumps, sluices and filters, interfere with navigation, fishing and other forms of recreation, cause taint and odour problems in potable waters, and in some instances, create a health hazard to humans, livestock and wildlife.

These problems are increasing because nutrient concentrations in water are rising as a result of human activity and natural processes. There is simultaneous and growing demand world-wide for improvements in water quality. The need to control algae, therefore, is increasing for environmental, recreational and public health reasons. Because of their small size and rapid growth rates, unicellular algae are difficult to control by methods used for other aquatic plants. Cutting and other forms of mechanical control can help to reduce problems with filamentous algae but are of very limited use.

Control of Algae Using Barley Straw

The application of barley straw to water has been tested in a wide range of situations and in many countries throughout the world. It has proved to be very successful in most situations with no known undesirable side-effects. It offers a cheap, environmentally acceptable way of controlling algae in water bodies ranging in size from garden ponds to large reservoirs, streams, rivers and lakes.

Despite the simplicity of the idea, experience has shown that there are a number of basic rules that must be followed to ensure that the straw works successfully.

HOW STRAW WORKS

In order to use straw effectively, it is necessary to understand something of how the process works. When barley straw is put into water, it starts to decompose and during this process chemicals are released which inhibit the growth of algae.

Rotting is a microbial process and is temperature dependent, being faster in summer than in winter. It may take 6-8 weeks for straw to become active when water temperatures are below 10 °C but only 1-2 weeks when the water is above 20 °C.

During this period, algal growth will continue unchecked. Once the straw has started to release the chemical it will remain active until it has almost completely decomposed. The duration of this period varies with the temperature and the form in which the straw is applied.
The straw should remain active for between four and six months, after which its activity decreases rapidly.

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TYPE OF STRAW

Barley straw works more effectively and for longer periods than wheat or other straws and should always be used in preference to other straws. A wide range of barley straw varieties have been tested, including some grown organically and they all produced similar levels of anti-algal activity.

Hay and green plant materials **should not** be used because they can release nutrients which may increase algal growth. Also they rot very rapidly and may cause de-oxygenation of the water.

SPEED OF EFFECT

Once the straw has become active, the time taken for control to become effective varies with the type of alga. 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.

It is preferable to add the straw very early in the spring before algal growth starts, and at least 3 months before an algal bloom is expected.

ABSORPTION AND INACTIVATION OF THE CHEMICAL

Products released from decomposing straw are very quickly absorbed by algae and are inactivated by mud and suspended sediment. Therefore, in waters which have high algal populations and are turbid with suspended mud, it is necessary to add **at least double** the recommended quantities of straw than in clear waters.

EFFECTS ON INVERTEBRATE ANIMALS AND FISH

There are no reports of harmful effects on invertebrates or fish except in a few instances where excessive amounts of straw were applied to small ponds and the water became deoxygenated.

These excessive doses were at least 100 times the doses recommended in this leaflet. In most instances, invertebrate populations increase substantially around the straw so providing a useful food source for fish.

There is anecdotal evidence that, in fish farms and fisheries, straw treatments may be associated with improved gill function and fish health and vigor.

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HOW MUCH STRAW DO I NEED?

Ponds, lakes and other still water bodies.
The most important measurement in calculating the quantity of straw required is the **surface area of the water**. Surprisingly, the volume of the water does not appear to affect the performance of the straw as might be expected.

This is because the majority of algal growth takes place in the surface layers of the water and so it is not necessary to measure the depth of the water or volume of the lake when calculating the quantity of straw required.

In still waters, the **initial dose** rate of straw should be **50 grams straw per square metre** of water surface (gm-2).

The **next dose rate** should be about half the initial rate, or about **25 grams straw per square metre**.

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 the **maintenance dose rate of 10 gm-2.**

On a **hectare** basis the dose rates are: **initial 500 kg/ha** ; **subsequent 250 kg/ha and maintenance 100 kg/ha.**

In turbid or muddy waters, it will always be necessary to add more straw than in clear, mud free waters. In different types of water body the quantity of straw needed can vary considerably and 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 10g /m2 or until algal growth starts to increase again when the dose should be increased to a previously effective level.

De-oxygenation can occur as the result of natural processes especially in prolonged hot weather when the solubility of oxygen in water is reduced and biological oxygen demand increased.

This de-oxygenation is often caused by algal blooms and so the presence of straw, which prevents the formation of these blooms, can reduce the risk of de-oxygenation.

Straw should **not be applied during prolonged periods of hot weather** to waters containing dense algal blooms as the combined oxygen demand from the algal bloom and the straw could temporarily increase the risk of de-oxygenation which may lead to loss of some fish.

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HOW TO APPLY STRAW:

The best way of applying straw varies with the size and type of water body. The best shape for a straw application is a cylindrical tube, as this reduces the surface area:volume ratio to a minimum. Straw sausages create the perfect shape for optimum decomposition.

WHERE TO APPLY THE STRAW

It is always preferable to apply several small quantities of straw to a water body rather than one large one. This improves the distribution of the active factors throughout the water body.

Straw works best if it is held near to the surface where water movement is greatest. This keeps the straw well oxygenated and helps to distribute the anti-algal chemical. In addition this ensures that the chemical is produced close to where the majority of the algae are growing and away from the bottom mud which will inactivate the chemical.

WHEN TO APPLY STRAW

Although straw can be applied at any time of year, it is much more effective if applied before algal growth begins. This is because the anti-algal agents released by the straw are more effective in preventing algal growth than in killing algae already present.

Therefore, straw is **best applied in the spring and autumn**, when water temperatures are low. The straw will become active within a month and will continue to inhibit algal growth for about 6 months. However, rapid algal growth can take place once the straw has rotted away and so further applications should be made every 4 to 6 months.

It is important to note that the rate at which straw rots varies considerably and regular observations should be kept so that **fresh straw can be added before the end of the 6 month period if necessary.**

It is not always possible to predict that an algal problem will occur and so it is sometimes necessary to treat an algal problem which has already developed. Some algae, mainly the small unicellular species and the cyanobacteria (blue-green algae), can be controlled by adding straw to existing blooms. The time taken for the algae to be controlled depends on a number of factors, of which water temperature is probably the most important.

At water temperatures above 20 °C straw has been effective in controlling algal blooms within 3-4 weeks, sometimes even faster.

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Avoid applying straw during prolonged periods of hot weather as the combined effect of the dying algae and the rotting straw may increase the risk of de-oxygenation. At lower temperatures, the process is slower and it may take 8 - 10 weeks to control the algae but the risk of de-oxygenation is then minimal.

An advantage of lower temperatures is that the straw lasts longer too. In the north of Scotland straw has given good control for between 8 and 10 months, whereas in the south of England control usually lasts no longer than 6 months.

This may also be related to the different nutrient concentrations in these two environments, with much higher dissolved nutrients being more often found in southern England.

When filamentous algae are the main problem, straw applied to dense floating mats will have very little useful effect unless combined with other treatments. After the initial straw treatment, further additions will be required to prevent the return of the algae.

Although a period of 6 months is suggested as the likely interval between straw applications, more frequent treatments may be necessary. It is inadvisable to wait until all the straw has rotted before making a second application as there will then be an interval when no chemical is being produced and rapid algal growth can take place. For the same reason, the old straw should not be removed for at least one month after the addition of the new straw. This allows time for the new straw to become active.

OTHER EFFECTS OF STRAW

During the numerous field trials in which straw has been applied in a number of forms and in a range of water bodies, various effects in addition to the control of algae have been noted.

While these have not been investigated in any detail, they have occurred sufficiently frequently to be worth noting as possible consequences of using straw.

Effects on other aquatic plants: No direct effect of straw on aquatic vascular plants has been found in either laboratory or field experiments. However, in several trials where straw has successfully controlled algae, there has been a noticeable increase in the growth of submerged vascular plants. It is likely that this is a result of the loss of competition from the algae, which has allowed the vascular plants to re-colonise water in which previously they were unable to compete with the algae.

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In some instances, the recovery of the vascular plants has been marked that they, in turn, caused problems to water users and required some form of management. However, they are generally easier to control and less troublesome than the algae and so are more acceptable in most waters.

In some instances, the recovery of the vascular plants has been so strong that they replaced the algal growth as the dominant plant form, so that subsequent treatment with straw was no longer needed.

Effects on invertebrates: It has been observed frequently that loose masses of well oxygenated straw provide a good habitat for aquatic invertebrates such as the Water Shrimp (Gammarus spp.).

These invertebrates, mostly detrital feeders, breed and grow rapidly in the safe environment created by the straw and their numbers can increase by several orders of magnitude within a few months. As the straw gradually rots away and the numbers of invertebrates increases, individuals leave the safety of the straw and become prey to fish and waterfowl.

Invertebrates are beneficial to water bodies as they help to decompose organic matter in the bottom; some of them graze on algae and aquatic plants and they form an important part of the food chain. Effects on fish and waterfowl: There have been a number of observations of improved growth, vigour and health of fish in waters treated by straw. One reason for this is likely to be the increased food supply in the form of invertebrate animals. Fish may also find it easier to find food in water that is not densely colonised by unicellular or filamentous algae.

However, another possible explanation is that, by controlling the algae, the straw allows better light penetration to deeper levels in the water so that photosynthesis can occur in a greater volume of the water body and so provide an improved environment for the fish.

The Game Conservancy has also noted that young ducklings require a diet that consists mainly of invertebrate animals. They found that adding straw to gravel pits significantly increased the survival of young ducklings. In a number of water bodies, ducks and other waterfowl have been observed to nest and roost on floating masses of straw. This has been particularly beneficial in areas subject to high levels of human interference and terrestrial predators as the floating straw masses are usually inaccessible from the bank.

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There have been a number of anecdotal reports that incidents of some fish diseases and parasites appear to have been reduced in fisheries and fish farms in which straw has been used.

SUMMARY

When algal problems occur in any water body, barley straw offers an environmentally acceptable and cost-effective form of control.

Straw should be applied twice each year, preferably in early spring before algal growth starts and in autumn.

Particularly in static waters, the straw should be loose, through which water can pass easily and should be held in straw sausages or cages.

The minimum effective quantity of barley straw in still or very slow flowing water is about 10 gm-2 but higher doses of up to 50 gm-2 should be used initially in densely infested and muddy waters. Doses should be reduced to 25 then 10 gm-2.

Straw should be supported by floats so that it does not sink to more than one metre below the surface, even when waterlogged. It is very important that straw does not come into contact with the muddy bottom.

e patient, this is a natural process which takes time to work!

Extracted from a report by Dr Jonathon Newman at
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