United States Patent Office 3,177,140 Patented Apr. 6, 1965

3,177,140

PROCESS FOR GROWTH CONTROL OF ALGAE

Robert J. Herschler, Camas, Wash., assignor to Crown Zellerbach Corporation, San Francisco, Calif., a corporation of Nevada

No Drawing. Filed June 5, 1962, Ser. No. 200,071
18 Claims. (Cl. 210—64)

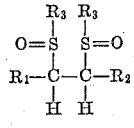
This invention relates to a process for controlling the growth and propagation of algae by applying thereto organic disulfoxides and sulfoxides as effective algaecides.

The general object of the present invention is to provide a new process of controlling or inhibiting growth and propagation of algae by applying thereto organic sulfoxides and disulfoxides, such compounds being more efficient on weight for weight basis than standard commercial algaecides, and being effective at low concentrations.

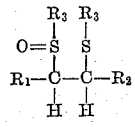
Methods of the production of the sulfoxides and disulfoxides are well known in the art. One method of preparation of such compounds comprises oxidizing the corresponding sulfides with an oxidizing agent, such as hydrogen peroxide, under well established conditions.

Organic disulfoxides and sulfoxides suitable in the practice of this invention are represented by the following formulas:

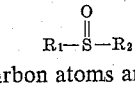
(1)



(2)



(3)



The number of carbon atoms and chemical structure of the radicals in the above-mentioned compounds may vary considerably as specified hereinbelow.

R_1 may represent hydrogen or alkyl groups containing between 1 and 10 carbon atoms, preferably between 3 and 6 carbon atoms in the Formulas 1 and 2 and 1 carbon atom (methyl group) in the Formula 3. R_2 may represent either alkyl group containing between 6 and 23 carbon atoms, preferably between 10 and 14 carbon atoms, or alkaryl group, such as dodecyl benzyl group, containing between 7 and 23 carbon atoms, preferably between 10 and 20 carbon atoms. R_3 may represent an alkyl group containing between 1 and 4 carbon atoms, preferably a methyl group. The total number of carbon atoms in the sulfoxides and disulfoxides of this invention may vary between 6 and 24, preferably between 12 and 18 carbon atoms.

Typical compounds applicable to the process of the present invention which are represented by the formulas hereinabove include 6-7 dimethyl sulfinyl octadecane, illustrative of the Formula 1; 6-methylthio-7-methyl sulfinyl octadecane, illustrative of the Formula 2; methyl decyl, methyl undecyl, and methyl dodecyl sulfoxides, illustrative of the Formula 3.

Exemplary of the compounds of this invention which are most effective algaecides are methyl decyl through methyl octadecyl sulfoxides, and bis(methyl sulfinyl) alkane in which the alkane group contains between 10 to 16 carbon atoms.

The compounds of this invention are useful in such important commercial applications as in swimming pools, cooling towers, and irrigation waters. The sulfoxides and disulfoxides may be applied as algaecides in accordance

with this invention by incorporating into an aqueous medium an effective amount thereof, i.e., an amount sufficient to control or inhibit growth and propagation of algae. The concentration of a compound of this invention in the aqueous medium may vary over a wide range, thus a concentration as low as about 1 p.p.m. may be sufficient in certain cases, however, a concentration of between 5 and 100 parts per million is generally satisfactory.

The following examples illustrate, but in no way limit, the application of the compounds of this invention.

Example 1

A microscopic green algae, Chlorella, was used in this example. A culture of the algae was maintained in a nutrient medium comprising magnesium sulfate (0.25 gram), calcium nitrate (1.0 gm.), sodium hydrogen phosphate (0.25 gm.), potassium chloride (0.12 gm.), a trace of ferric chloride, and water to make 1 liter. 50-milliliter samples of the nutrient medium were placed in sterile glass wool stoppered flasks. 1 ml. of the nutrient medium containing the culture was added to each of the flasks to make up test samples. To each flask was added a different sulfoxide. The sulfoxide concentration in each test sample was at 50 p.p.m. level. The sulfoxides used were: methyl hexyl, methyl octyl, methyl decyl, methyl undecyl, methyl dodecyl, methyl tetradecyl, methyl hexadecyl, and methyl octadecyl sulfoxides. The treated test samples were maintained in a greenhouse with adequate sunlight. The sulfoxides were found to be very effective and algae kill was easily measured by disappearance of green chlorophyl color after a period of one week.

Example 2

The procedure of Example 1 was repeated using disulfoxides derived from the following olefins plus dimethyl disulfide followed by oxidation: hexene-1, octene-1, decene-1, dodecene-1, tetradecene-1, and hexadecene-1. The disulfoxides were found to be very effective algaecides.

Example 3

The procedure of Example 1 was repeated except that the test period was 30 days and methyl decyl, methyl undecyl, methyl dodecyl, and methyl tetradecyl sulfoxides were used at a concentration of 6, 8, 10, 15, 20 and 25 p.p.m. All the compounds were effective algaecides, however, methyl dodecyl sulfoxide was found to be more effective than the other compounds at the low concentration level of 6 p.p.m.

Example 4

The procedure of Example 1 was followed except that the test period was 30 days and 6, 7-dimethyl sulfinyl octadecane was added at 5, 10 and 25 p.p.m. concentration level. Excellent and rapid control of algae growth was obtained.

Example 5

The procedure of Example 1 was followed using 6-methylthio-7-methyl sulfinyl octadecane at 5, 10 and 25 p.p.m. concentration level. Excellent control of algae growth was obtained in a test of 14 days' duration.

Example 6

The test procedure of Example 1 was followed using dodecyl benzyl methyl sulfoxide at 5, 10 and 25 p.p.m. concentration level. Excellent control of growth and propagation of algae was obtained in a test of 14 days' duration.

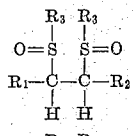
Thus from the foregoing description of this invention it will be apparent that I have discovered a new method of applying organic sulfoxides and disulfoxides as excel-

ent and highly effective agents for controlling the growth nd propagation of algae.

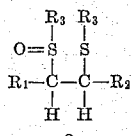
Reasonable variations and modifications are possible vithin the scope of the foregoing disclosure and appended laims. Having thus described my invention in preferred mbodiments, I claim:

1. A method of controlling the growth and propagaion of algae which comprises applying to said algae an ffective amount of a compound selected from the group onsisting of disulfoxides and sulfoxides represented by he general formulas:

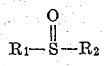
1)



2)



3)



vherein R_1 is selected from the group consisting of hydrogen and alkyl group containing between 1 and 10 carbon atoms; R_2 is selected from the group consisting of alkyl groups containing between 6 and 23 carbon atoms and alkaryl groups containing between 7 and 23 carbon atoms; R_3 is an alkyl group containing between 1 and 4 carbon atoms; and the total number of carbon atoms in said compound is between 6 and 24.

2. The method of claim 1 wherein the total number of carbon atoms is between 12 and 18.

3. The method of claim 1 wherein said compound is applied in a concentration of at least about 1 part per million.

4. The method of claim 1 wherein said compound is applied in a concentration between 5 and 100 parts per million.

5. The method of claim 1 wherein R_1 in the Formulas 1 and 2 represents an alkyl group containing between 3 and 6 carbon atoms.

6. The method of claim 1 wherein R_1 in the Formulas 1 and 2 represents a hydrogen atom.

7. The method of claim 1 wherein R_1 in the Formula 3 represents a methyl group.

8. The method of claim 1 wherein R_2 represents an alkyl group.

9. The method of claim 1 wherein R_2 represents an alkyl group containing between 10 and 14 carbon atoms.

10. The method of claim 1 wherein R_2 represents an alkaryl group.

11. The method of claim 1 wherein R_2 represents an alkaryl group containing between 10 and 20 carbon atoms.

12. The method of claim 1 wherein R_3 represents a methyl group.

13. The method of claim 1 wherein said compound comprises dodecyl benzyl methyl sulfoxide.

14. The method of claim 1 wherein said compound comprises methyl decyl sulfoxide.

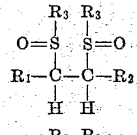
15. The method of claim 1 wherein said compound comprises methyl undecyl sulfoxide.

16. The method of claim 1 wherein said compound comprises methyl dodecyl sulfoxide.

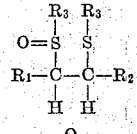
17. The method of claim 1 wherein said compound comprises a bis(methyl sulfinyl) alkane, in which the alkane group contains between 10 to 16 carbon atoms.

18. A method of controlling the growth and propagation of algae which comprises applying to said algae, in a concentration between 5 and 100 parts per million, a compound selected from the group consisting of disulfoxides and sulfoxides represented by the general formulas:

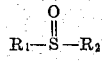
(1)



(2)



(3)



wherein the total number of carbon atoms in said compound is between 12 to 18; R_1 in Formulas 1 and 2 represents an alkyl group containing between 3 and 6 carbon atoms; R_1 in Formula 3 represents a methyl group; R_2 represents an alkyl group containing 10 to 14 total number of carbon atoms; and R_3 represents a methyl group.

References Cited by the Examiner

UNITED STATES PATENTS

2,957,799	10/60	Goodhue et al.	167—22
2,999,105	9/61	Louthan	167—22

MORRIS O. WOLK, *Primary Examiner.*