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METHOD OF KILLING SUBMERGED WATERWEEDS

John M. Shaw and Thomas R. Bartley, Denver, Colo., and Richard S. Rosenfels, Richland, Wash., assignors to the United States of America as represented by the Secretary of the Interior

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The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to us of any royalty thereon in accordance with the provisions of the act of April 30, 1928 (Ch. 460, 45 Stat. L. 467).

The present invention relates to a herbicidal composition and a method for killing and controlling the growth of waterweeds in canals, irrigation ditches, ponds, and like bodies of water.

The elimination of submersed waterweeds from irrigation ditches is a serious problem. Besides cutting down the capacity of irrigation canals, waterweeds cause silt to be deposited which makes costly dredging necessary. Another toll taken by these weeds is loss of water through increased evaporation and seepage. When the canal water level must be raised above normal in an attempt to increase the flow of water which is retarded by waterweeds, erosion and breaks are common. Growths of waterweeds clogs drains, cause them to function poorly, may keep potentially good land waterlogged, and often increase alkaline deposits in the soil. Heretofore, methods for the removal and control of waterweeds have been both expensive and laborious.

Accordingly, it is an object of this invention to provide a cheap herbicidal composition for controlling the growth of waterweeds and a simple method for the application of such compositions.

Other objects and advantages will be apparent or will appear hereinafter.

These objects and advantages are accomplished in accordance with the present invention of the method for filling submersed waterweeds growing in a body of water which comprises the pressurized introduction of a finely divided herbicidal agent beneath the surface of the water body in which the waterweeds to be eliminated are growing, said herbicidal agent being comprised of a mixture of aromatic hydrocarbons having a boiling point range lying between about 250 to 450 degrees Fahrenheit and an emulsifying agent.

Suitable aromatic hydrocarbons for purposes of this invention include those distillate fractions of coal tar or petroleum origin which are composed of the higher homologues of benzene and of which not less than about 10 percent have a boiling point below about 280 degrees Fahrenheit. Such materials would include coal tar naphtha, solvent naphtha, xylenes, iso-propyl benzene, n-propyl benzene, methyl-ethyl benzene, tri-methyl benzene, methyl propyl benzene, di-methyl ethyl benzene, tetramethyl benzene,

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penta-methyl benzene, hexamethyl benzene, and like homlogues of benzene. A presently preferred commercially available hydrocarbon (solvent naphtha) has the following characteristics:

Flash point, not less than	°F	87
Aniline point, lower than	°F	−30
Kauri-butanol value, higher than	ml	80
ASTM D-86 distillation:		
Starting point	°F	278
Not more than 10 percent at	°F	286
Not less than 90 percent at	°F	385
End point, not higher than	°F	420

Suitable emulsifying agents for use in accordance with this invention are those capable of forming substantially stable emulsions of the aforementioned aromatic hydrocarbons in water. Cheap emulsifiers of this type include sulfonated vegetable and petroleum oils such as sulfonated castor oil, sulfonated coconut oil, sulfonated petroleum, and the like; the invention, however, is not to be construed as limited thereto.

In operation, the aromatic hydrocarbon and the emulsifying agent are thoroughly mixed and the mixture is then forced under pressure through a spray nozzle having very small orifices which is under the surface of the water body in which the waterweeds to be eliminated are growing. Good mixing, high pressures (pressures as high as 450 p. s. i. have been used successfully), and small nozzle openings all help to increase the efficiency of the treatments by causing better dispersion in the water, thus sending the emulsion further down stream before it breaks and rises to the surface. It is presently preferred to introduce between about 125 p. p. m. to 300 p. p. m. (parts of chemical per million parts of water in the canal) to obtain satisfactory weed control and maintain this concentration for about one hour in contact with the waterweeds. To maintain a concentration of 185 p. p. m. for an hour, 5 gallons of the chemical formulation must be applied to each cubic foot per second of flow over a period of one hour. However, it is to be noted that elimination of waterweeds is possible with even lower concentration of the herbicidal agent; good kills have been obtained using concentration as low as about 125 p. p. m.

The following examples will show how the invention may be carried out but the invention is not limited thereto.

Example I

A canal which has a designed capacity of 300 cubic feet per second was so badly infested with

horned pondweed (*Zannichellia palustris*) that the maximum flow had been reduced by 50 percent. Coal tar naphtha (boiling point range 275 to 406° F.) was thoroughly mixed with 10 percent by volume of an emulsifying agent (equal parts of mahogany soap and sulfonated castor oil). This mixture was introduced into the canal beneath the surface at a pressure of 50 pounds per square inch through a spray nozzle with a 0.22-inch opening. The concentration of chemical was maintained at 185 p. p. m. for 60 minutes. The full carrying capacity of the canal was restored within 72 hours after this treatment, and the canal was free of submerged waterweeds for a distance of one mile below the point of application.

Thus an extended length of flowing watercourse, i. e. a mile thereof, was effectively cleared of weeds by the dispersal of the herbicidal mixture at the upstream end of such length at a rate maintaining a low concentration therein for a period of one hour. The turbulence accompanying the water flow, and the presence of the dispersing agent, was thus effective for maintaining the dispersion, carrying the herbicidal mixture forcibly against the weeds, and aiding its penetration of the weed tissues.

Example II

A canal in which sago pondweed (*Potamogeton pectinatus*) was the predominating species, but there were also scattered patches of horned pondweed and both species were in an advanced stage of maturity, was treated for one hour with 200 p. p. m. of a mixture of coal tar naphtha and 5 percent by volume of mahogany soap. Ninety percent of the leaves and stems of the sago pondweed had turned brown within 24 hours. Horned pondweed reacted more slowly but the final injury was about the same.

Thus it is apparent that a new simple and cheap method for the control of submersed waterweeds has been devised.

While the examples are confined to the eradication of horn pondweed and sago pondweed, the invention is not limited thereto. Similar tests have been made on other types of submersed waterweeds such as various species of Potamogeton, Zannichellia, Anacharis, Myriophyllum, Ceratophyllum, Ranunculus, and like submersed aquatic vegetation, and the method has been found to be equally effective.

While the examples describe the herbicidal agent as mixtures of coal tar naphtha and an emulsifier, many similar aromatic hydrocarbons and other emulsifiers have been tested and found to be as effective as the specific compositions described; however, economics of the problem place the described compositions in a preferred position at the present time.

While the present invention relates to the control and eradication of submersed waterweeds, a concurrent result is snail control. Although snail control is of minor importance in the United States, it is a problem of no little significance to other countries. Egypt is vitally concerned because many species of snails serve as hosts for such parasites, such as blood flukes, liver flukes, and the like. The disease caused by these parasites often reaches epidemic proportion along the Nile River. Snails feed on waterweeds; therefore, control of their food supply should reduce the snail population. Actually, the snails in the streams and canals in this country have been found to be directly affected (killed) by this composition; so too have mosquito larvae, cray-fish, and fish.

These compositions of this invention are volatile enough so that in a short time after the emulsion breaks they evaporate and are dissipated into the atmosphere, thereby minimizing any possible toxicity. While the normal concentrations used for waterweed control are not toxic to crop plants nor to animals which might drink the treated water, precautions should be taken to prevent the full concentration reaching such plants or animals. Care should be taken in their use due to the inflammability of the naptha. Breathing naphtha fumes and prolonged contacts of the bare skin with the composition should be avoided.

Since many widely differing embodiments of the invention will occur to one skilled in the art, the invention is not limited to the specific details illustrated or described, and various changes can be made therein without departing from the spirit and scope thereof.

What is claimed is:

The method of killing submerged waterweeds in an extended length of a flowing watercourse that comprises forming a mixture of surface active dispersing agent with a volatile herbicidal hydrocarbon having a boiling range lying between 250 and 400 degrees Fahrenheit, dispersing said mixture into the upstream region of the length of watercourse to be treated by submersed atomization under high pressure at a rate producing therein a concentration of from 125 to 300 parts of herbicidal mixture per million parts of water, allowing the flow of the watercourse to carry the dispersed mixture downstream into contact with the waterweeds throughout the extended length of stream being treated while continuing the dispersing of mixture at the upstream end thereof for a period of the order of one hour, the flow of the water and the presence of the surface active dispersing agent maintaining the herbicidal hydrocarbon dispersed throughout the depth of the watercourse during its passage down the extended length of watercourse being treated, the flow of the water carrying the dispersed herbicidal hydrocarbon into forcible contact with the waterweeds, and the dispersing agent aiding in the penetration of the herbicidal hydrocarbon into the waterweed tissues, whereby effective killing of the waterweeds is obtained.

JOHN M. SHAW.
THOMAS R. BARTLEY.
RICHARD S. ROSENFELS.

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