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METHOD OF CONTROLLING WEEDS EMPLOYING A HEXACHLOROCYCLOPENTENONE MINERAL OIL COMPOSITION

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This invention relates to a new and economical method for the control of undesirable vegetation. The specific concept of this invention lies in the control of weeds using a hexachlorocyclopentenone-mineral oil composition.

The use of mineral oils for the control of weeds is an art which has been in practical use for many years. Mineral oils are employed for the control of weed growth along railroad rights-of-way, along highways, in parking areas, and similar non-agricultural areas. Also, such oils are used to control weeds in agricultural lands, as for example, the control of clumps and individual plants of Johnson grass in cotton fields.

Generally, the cost of the oil is a significant factor in such applications, since quite high rates of application are necessary. One way to reduce this cost has been to employ selected oils having high naphthenic and aromatic content relative to paraffinic content. These oils are somewhat more phytotoxic than ordinary kerosene and diesel oil. Rather high rates, even of these selected phytotoxic oils, are still needed, and their use is less convenient to railroads and farmers than the use of the readily-available diesel oils, kerosenes, or fuel oils.

We have now discovered that the addition of small and inexpensive quantities of hexachlorocyclopentenone into ordinary mineral oils such as kerosene, diesel oil, or fuel oil imparts remarkably enhanced phytotoxicity, and that the resultant compositions are rapid and effective herbicidal oils.

This is particularly surprising in that hexachlorocyclopentenone itself is not a herbicide at the rates of application with which the invention is concerned. We can offer no explanation for the observed effect, particularly insofar as the mechanism of herbicidal oil action is not known.

Hexachlorocyclopentenone is a known chemical, existing in two isomeric forms designated as hexachlorocyclopenten-2-one and hexachlorocyclopenten-3-one. It has long been known that these two forms can readily be equilibrated with each other as for example upon warming. The present invention is operative with either isomer or a mixture of both, and therefore the term hexachlorocyclopentenone is used herein to refer to either or a mixture of both.

The term "mineral oil" refers to a liquid hydrocarbon obtained from petroleum, coal, or shale, as distinguished from an oil of direct vegetable or animal origin. The preferred mineral oils are diesel oil and kerosene because of their low cost and ready availability, although the invention is operable with any mineral oil boiling above 200 degrees Fahrenheit. The lower-boiling oils have too much volatility and evaporate from the foliage of the treated weeds or locus before sufficient phytotoxic damage is done. No upper limit to the boiling point range can be given since the invention is satisfactorily operative with oils which contain constituents so high boiling as to be essentially undistillable; an example of such an oil would be the substance known in the trade as bunker C oil. We have found no other limitations on the type of mineral oil which may be employed to make the compositions of the invention.

The use of the so-called "herbicidal oils" which were

described above is permissable with the invention and a definite and major enhancement of the herbicidal activity of the resultant composition over that of the parent oil results. Nonetheless, a major benefit of the invention is that it is not necessary to employ such a "herbicidal oil" but that an oil which is not per se significantly herbicidal may be used.

The compositions of the invention preferably should contain no less than about 0.05 gallon of hexachlorocyclopentenone per one hundred gallons of mineral oil and no more than about twenty gallons of hexachlorocyclopentenone per one hundred gallons of mineral oil. At greater dilutions the effect activating can be detected but becomes increasingly negligible as the dilution increases beyond the stated value, and at lower dilutions the somewhat irritating odor of the hexachlorocyclopentenone becomes evident. Also at lower dilutions, the amount of hexachlorocyclopentenone is uneconomically large and in excess of that required to give the desired herbicidally-activating effect to the oil. The exact optimum amount depends on the weed species, the weather, and other environmental factors.

The amount of the composition to be applied to the locus or foliage varies with the weed species involved, but is generally sufficient to thoroughly wet the surface of the foliage. Ordinarily, a rate of ten to several hundred gallons per acre is used for overall spraying. For "spot treatment," that is, application to individual plants and clumps of plants, a per-acre rate is meaningless for all practical purposes, and the technique is best described as wetting the locus or foliage. With some plants, a further economy can be made by treating only a part of the plant with the herbicidal oil composition. For example, with Johnson grass the lower eight inches of the plant can be sprayed to produce kill. With some brush species, only a portion of the lower trunk need be treated to produce kill. The present invention is not limited to any particular technique of application, since the compositions of the invention need only be brought into contact by any convenient means such as spraying or pouring with the foliage and stems to be killed.

The compositions of the invention may be used in conjunction or admixture with other herbicides if desired. For example, a long lived residual herbicide such as 2,3,6-trichlorophenylacetic acid, polychlorobenzoic acids, and trichloroacetic acid or esters thereof may be included in the composition to prevent further weed growth from appearing in the treated area; or, halogenated phenoxyacetic herbicides may be used for enhancement of the effect on various species of brush.

Example

The compositions listed in the table below were applied as 75 gallons per acre of spray to a weedy roadside area infested with goldenrod, chicory, daisy, oxalis, wild carrot, quackgrass, and bluegrass. The results were observed three days later and recorded as percent of kill of the above-ground portions of the plant ("top kill," as indicated by desiccation and wilting).

Additive to Kerosene	Rate of Additive (lbs./75 gal.)	Top Kill (percent)
None	None	0
Hexachlorocyclopentenone	2	90
Hexachlorocyclopentenone	8	100
Hexachloroacetone	8	0
Hexachlorobutene	8	0

The last two compounds were run for comparison purposes, because of some degree of chemical similarity. Also, for comparison, hexachlorocyclopentenone was

sprayed in the form of an emulsion with water, without kerosene. At eight pounds per acre, no significant top kill was produced.

Although the various limitations of this invention have been described, modifications and variations will suggest themselves to persons skilled in the art upon reading this discloseure. These are intended to be comprehended within the spirit of this invention.

I claim:

1. The method for controlling the growth of weeds which comprises applying to the weeds to be treated a phytotoxic rate of a hexachlorocyclopentenone-mineral oil composition containing at least 0.05 gallon of hexachlorocyclopentenone per one hundred gallons of mineral oil per acre of treated weeds.

2. The method of controlling the growth of Johnson grass which comprises applying to the Johnson grass to be treated a phytotoxic amount of a hexachlorocyclopentenone-mineral oil composition containing at least 0.05 gallon of hexachlorocyclopentenone per hundred gallons of mineral oil per acre of treated Johnson grass.

3. The method of controlling the growth of Johnson grass which comprises applying to the crown and basal portion of the Johnson grass a phytotoxic amount of a hexachlocyclopentenone-mineral oil composition containing at least 0.05 gallons of hexachlorocyclopentenone per hundred gallons of mineral oil per acre of treated Johnson grass.

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