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FUNGICIDAL COMPOSITION

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This invention relates to pesticidal and fungicidal compositions and more particularly to such compositions which are intended or adapted to be dispersed in water for application to plants, fruit, or the like in the form of a spray.

The fungitoxicity of certain metal salts of dodecylbenzene sulfonic acid is known. Difficulty is sometimes encountered in drying and handling these materials, but they are effective fungicides and desirable ingredients of compositions of the type characterized above, particularly the salts of polyvalent metals such as barium, calcium, iron, manganese, copper, zinc, etc. Normal wet spray applications of such compositions utilize aqueous dispersions which contain in the neighborhood of only 0.01% to 2.0% of the desired salt or salts. For use in wet sprays, therefore, good dispersibility in water is a necessity for any such salt marketed or distributed in the form of a dry composition, whereas the polyvalent metal salts of dodecylbenzene sulfonic acid are quite difficult to disperse in dilute aqueous suspensions.

One of the principal objects of the present invention is to provide a dry fungicidal composition which can be dispersed quickly and readily in aqueous liquid to form a wet spray containing one or more of the aforesaid polyvalent metal salts of dodecylbenzene sulfonic acid.

Another object is to simplify manufacturing and drying problems and to eliminate the need for definite particle size in the production of said polyvalent metal salts of dodecylbenzene sulfonic acid for use in dry fungicidal compositions.

A further object is to provide improved suspensions or dispersions of said polyvalent metal salt or salts of dodecylbenzene sulfonic acid which are superior to those heretofore obtainable with compositions containing the dried metal salts.

Other objects of the invention will appear hereinafter.

The foregoing objects are realized by the incorporation in dry fungicidal compositions of a dry mechanical mixture of the sodium and/or potassium salts of dodecylbenzene sulfonic acid and one or more water-soluble salts of polyvalent metals. When the dry composition is eventually added to water, these ingredients dissolve and then react to form a precipitate of the desired polyvalent metal salt of dodecylbenzene sulfonic acid. Thus problems of mechanically dispersing the insoluble dry salt or salts in water are completely eliminated, and the salt is formed in the aqueous liquid in the form of a very finely divided precipitate which remains in suspension for a long time. Such dispersions of polyvalent metal salts of dodecylbenzene sulfonic acid are substantially superior to those heretofore obtainable by mechanically dispersing the dried metal salt in aqueous medium.

It will be understood that in case it is desired to have a mixture of salts of different polyvalent metals in the spray, then two or more water-soluble salts of different polyvalent metals are included in the dry composition. Furthermore, in addition to the ingredients already mentioned, the dry composition may include other materials adapted for spray application and inert toward the reaction mentioned above, such as clays, fuller's earth, etc., sticking agents, nutrients or fertilizers, various other types of pesticides or fungicides, etc.

The amount of polyvalent metal salt to be employed should preferably be the stoichiometric equivalent of the amount of sodium and/or potassium dodecylbenzene sulfonate, in order that all or substantially all of the latter will be converted into the precipitate mentioned above. If less than the equivalent amount is used, then some of the sodium or potassium sulfonate will remain in solution, whereas on the other hand excess polyvalent metal salt is simply wasted. Of course, two or more metal ions can be used if desired by simply combining two or more polyvalent metal salts to make up the desired total amount. The selection of the metal ion or ions to be used will depend on considerations of availability and cost, except in cases where the characteristics and/or properties of particular metal ions may make them preferred. For example, copper salts tend to be more phytotoxic, while less soluble salts such as the barium salt tend to be more resistant to washing off the plants.

In addition to the considerations stated above, the choice of the metal ion or ions to be used may sometimes be determined by special factors, for example, a need to supplement mineral deficiencies. Broadly speaking, however, any water-soluble salt or salts of any desired polyvalent metal or metals can be employed. The metals most commonly used for the purposes of the invention include zinc, copper, barium, iron and manganese, but in some cases it may be preferred to employ other polyvalent metals such as magnesium, calcium, lead, mercury, etc. Water-soluble salts of either organic or inorganic acids can be used. Illustrative examples of suitable water-soluble salts are zinc sulfate, zinc chloride, zinc acetate, zinc nitrate, cupric sulfate, cupric acetate, cupric chloride, cupric nitrate, barium chloride, barium acetate, barium butyrate, barium cyanide, barium nitrate, barium propionate, manganese sulfate, manganese acetate, manganese chloride, managanese benzoate, manganese bromide, manganese nitrate, manganese silicofluoride, ferrous sulfate, magnesium acetate, magnesium chloride, magnesium nitrate, magnesium silicofluoride, calcium chloride, calicum acetate, calcium sulfate, lead acetate, lead nitrate, mercuric acetate, mercuric chloride, mercuric nitrate, etc.

By way of example, stoichiometric equivalents of sodium dodecylbenzene sulfonate and zinc sulfate, together with a small amount of finely divided synthetic calcium silicate such as "Micro-Cel," form a nice dry mix when mixed with mortar and pestle or by equivalent simple mechanical operations. This mixture may be combined by any suitable mixing procedure with other desired ingredients as already stated. The resulting dry composition is simply bagged or filled into other desired containers for storage and distribution. When it comes to actual use as a spray, the composition is simply added to water in the desired proportion and the finely divided precipitate forms in the dispersion as already explained. As already indicated, the amount of the dry composition will usually be such as to provide a concentration of polyvalent metal salt of dodecylbenzene sulfonic acid in the dispersion which is in the approximate range of 0.01% to 2.0%.

In addition to its advantages in use, the invention further simplifies the production of the original sodium or potassium dodecylbenzene sulfonate in that no definite particle size is required for use in the dry fungicidal composition. A simple milling of the dried sulfonate suffices to produce a stable, free-flowing material that can be

added to the fungicidal composition with entirely satisfactory results.

The following examples are typical of compositions embodying the invention:

I. Dry mix formula:
38.6 parts 90% sodium dodecylbenzene sulfonate
1.5 parts synthetic calcium silicate (+325 mesh)
9.0 parts zinc sulfate monohydrate
1.0 part lignin sulfonate

II. Dry mix formula:
2010 parts 90% sodium dodecylbenzene sulfonate
214 parts copper sulfate pentahydrate powder
332 parts zinc sulfate monohydrate
81 parts synthetic calcium silicate (+325 mesh)

III. Dry mix formula:
38.6 parts 90% sodium dodecylbenzene sulfonate
9.0 parts zinc sulfate monohydrate
15.8 parts synthetic calcium silicate (+325 mesh)

IV. Dry mix formula:
38.6 parts 90% sodium dodecylbenzene sulfonate
9.0 parts zinc sulfate monohydrate
15.8 parts synthetic calcium silicate (+325 mesh)
6.5 parts colloidal magnesium aluminum silicate

V. Dry mix formula:
3.86 parts 90% sodium dodecylbenzene sulfonate
1.22 parts barium chloride-dihydrate

VI. Dry mix formula:
3.86 parts 90% sodium dodecylbenzene sulfonate
0.86 part calcium sulfate dihydrate

It will be understood that the invention is not restricted to the details of the foregoing description and examples and that reference should be had to the appended claims for a definition of its limits.

What is claimed is:

1. A fungicidal composition adapted when mixed with water to form a wet spray containing a dispersed suspension of water-insoluble polyvalent metal salt of dodecylbenzene sulfonic acid as an active fungicidal ingredient, said composition comprising a dry, comminuted, substantially free-flowing physical mixture of a water-soluble dodecylbenzene sulfonate of the group consisting of the sodium and potassium sulfonates and a water-soluble polyvalent metal salt of the group consisting of the water-soluble salts of zinc, copper, barium, iron, manganese, magnesium, calcium, lead and mercury, said mixture being packaged for distribution in the dry state and said sulfonate and said water-soluble metal salt having approximately stoichiometric proportions and adapted to react when added to water to form a stable aqueous suspension of a finely divided dispersed precipitate of said water-insoluble metal salt of dodecylbenzene sulfonic acid.

2. A composition as defined in claim 1 including at least two water-soluble salts of polyvalent metals.

3. A composition as defined in claim 1, said water-soluble metal salt being zinc sulfate.

4. A composition as defined in claim 1, said water-soluble metal salt being manganese sulfate.

5. A composition as defined in claim 1, said water-soluble metal salt being cupric sulfate.

6. A composition as defined in claim 1, said water-soluble metal salt being ferrous sulfate.

7. A composition as defined in claim 1, said water-soluble metal salt being barium chloride.

8. The method of preparing a stable aqueous suspension of a water-insoluble polyvalent metal salt of dodecylbenzene sulfonic acid for use as a wet fungicidal spray which comprises forming a dry, comminuted, substantially free-flowing physical mixture in approximately stoichiometric proportions of a water-soluble dodecylbenzene sulfonate of the group consisting of the sodium and potassium sulfonates and a water-soluble polyvalent metal salt of the group consisting of the water-soluble salts of zinc, copper, barium, iron, manganese, magnesium, calcium, lead and mercury, packaging said mixture for distribution in dry form, and finally preparing the desired wet spray for use by adding the appropriate amount of said dry mixture to water, thereby causing a reaction between said sulfonate and said water-soluble metal salt to form said water-insoluble polyvalent metal salt of dodecylbenzene sulfonic acid as a finely divided precipitate in dispersed aqueous suspension.

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