

UNITED STATES PATENT OFFICE

2,299,604

FUNGICIDAL COMPOSITION

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No Drawing. Application December 1, 1939,
Serial No. 307,185

6 Claims. (Cl. 167—30)

The present invention relates to compositions for killing fungi which cause epidermophytosis, popularly referred to as "athlete's foot," which latter name is commonly employed owing to the prevalence of the disease among persons making use of gymnasiums, locker rooms, swimming pools and bathrooms which are utilized by large numbers of persons.

The infection known as "athlete's foot" is contagious and communicable by means of contaminated clothing and contaminated equipment, structures and floors, particularly the floors of gymnasiums, swimming pool rooms or of areas around swimming pools, and of locker rooms used in connection with gymnasiums and swimming pools, on the floors of which the skin of the feet of persons come in direct contact.

It is an object of the present invention to provide a composition which, when applied to the floors of gymnasiums, to the floor around swimming pools, to the floors of bathrooms, and on the floors of locker rooms used in connection with gymnasiums and swimming pools, will kill, or render harmless to humans, the fungi which cause epidermophytosis or "athlete's foot," and thereby prevent, or lessen, the communication of the disease to persons not infected with it.

A further object of the invention is to provide a composition suitable for use in water as a foot bath, in which persons utilizing gymnasiums, swimming pools, public baths, and locker rooms used in connection therewith, may immerse or bathe their feet in order to kill the fungi of "athlete's foot" which may have lodged upon, or adhered to, their feet by walking upon infected floors, equipment or structures.

I have discovered that many water soluble salts of inorganic acids which are compatible with phenoxyacetic acid, when mixed in water solution with phenoxyacetic acid in proper proportion, increase or enhance the fungicidal power or properties of the phenoxyacetic acid. The fungicidal power of the water solution of the phenoxyacetic acid and the salt of the inorganic acid is more than the sum of the fungicidal powers of the phenoxyacetic acid and the salt of the inorganic acid separately in water solution in the same concentrations.

Examples of compatible salts of inorganic acids which increase the fungicidal powers of phenoxyacetic acid are: sodium chloride, sodium sulphate, potassium chloride, potassium sulphate, magnesium chloride, magnesium sulphate, calcium chloride, ammonium chloride, and zinc chloride.

The composition is prepared for use by dissolving the phenoxyacetic acid and the salt in water. In preparing this solution mixtures of two or more of the salts may be employed, instead of a single salt. The composition so prepared may also include other fungicidal agents, such as paranitrophenol, or other components which are compatible with the phenoxyacetic acid and salt or mixtures of salts.

A composition including phenoxyacetic acid, paranitrophenol, water and one or more of the salts described above is a particularly advantageous composition, owing to the fact that the solubility of the paranitrophenol or the phenoxyacetic acid in the salt solutions is not significantly affected by the presence of the other, and to the further fact that the fungicidal power of paranitrophenol is also increased by said salts. As a consequence, solutions which are saturated with phenoxyacetic acid may have their fungicidal powers further increased by the addition of paranitrophenol, though in practice I may use the paranitrophenol and phenoxyacetic acid together in such proportion that neither the phenoxyacetic acid nor the paranitrophenol saturate the solution.

The concentration of the phenoxyacetic acid in the prepared solution may vary within wide limits, but in view of the foregoing disclosures it will be evident to the person skilled in the art that it should be employed in high enough concentration in solution to give, in combination with the enhancement of its fungicidal power by the salt, a resulting fungicidal power high enough for the purposes herein described. The salt concentration in the solution may also vary within wide limits in the composition prepared for use. In the composition as prepared for use in the form of a solution, I have found that the salt concentration should be at least two and one-half per cent based upon the weight of the prepared solution, since below this percentage there does not appear to be any practical or commercial enhancement of fungicidal power, so far as determinable by present known methods of determining fungicidal power. In general it is more advantageous to employ higher percentages of salt in the prepared solution, for example from 6 per cent to saturation of the salt in the prepared solution. In general, the enhancement of the fungicidal power increases as the percentage of salt in the solution increases.

The compositions of the present invention may be prepared by adding the phenoxyacetic

acid and salt as separate reagents to the same body of water and dissolving them therein, or a mixture of the phenoxyacetic acid and salt may be preliminarily prepared and the mixture thereafter dissolved in water, the relative proportion of phenoxyacetic acid and salt in such mixture being such as to give the desired concentration of salt in the body of water in which it is dissolved and the resultant fungicidal power necessary for the purposes herein described. In marketing my invention, I preferably make mixtures of phenoxyacetic acid and the salt, without dissolving them in water, and sell these mixtures, in powdered, granular or crystalline form, with suitable instructions for utilizing them in water solution according to the present invention. The said mixtures, therefore, constitute an essential part of my invention, and are to be understood as being included within the terms of the appended claims. Since the feet of persons, coming from showers may be slightly alkaline from soap, a small amount of suitable acid material cheaper than the phenoxyacetic acid may be included in the mixture as a buffer to prevent partial neutralization of the phenoxyacetic acid by such soap. Examples of such addition agents, which in the concentrations used are without fungicidal power, are sodium bisulfate and citric acid.

In the foregoing description and in the appended claims, it is to be noted that when reference is made to enhancement or increase of fungicidal powers or properties of the phenoxyacetic acid by means of the salts of inorganic acids which are compatible with the said phenoxyacetic acid, it is intended to indicate that the fungicidal powers or properties of the phenoxyacetic acid are greater in the presence of said salts than in their absence, and that the resulting fungicidal powers or properties of a water solution containing both the phenoxyacetic acid and the salt in dissolved condition are greater than the sum of the fungicidal powers of separate solutions of the phenoxyacetic acid and the salt of respectively the same concentrations in which the phenoxyacetic acid and the salt are present in a mixture of them in dissolved condition in the same body of solvent.

When I state herein that the salts of the inorganic acids or other substances are compatible with the phenoxyacetic acid, I intend to indicate that the said salts and other substances do not act upon the phenoxyacetic acid in water solution in such a manner as to be destructive of the fungicidal powers of the phenoxyacetic acid in water solution.

The following specific examples are given as illustrative of compositions prepared according to the present invention, it being understood that the invention is not confined to the specific examples or the proportions of ingredients recited therein.

Example I

0.050 pound of powdered phenoxyacetic acid are intimately mixed with 0.95 pound of finely divided solid sodium chloride.

The whole of this mixture is dissolved in one gallon of water for use.

Example II

0.050 pound of powdered phenoxyacetic acid are intimately mixed with 0.945 pound of solid sodium chloride in small crystal or pulverized form, and 0.005 pound of powdered citric acid.

The whole of this mixture is dissolved in one gallon of water for use.

Example III

0.050 pound of powdered phenoxyacetic acid are intimately mixed with 0.945 pound of solid magnesium sulphate in fine crystal or pulverized form, and 0.005 pound of powdered sodium bisulfate.

The whole of this mixture is dissolved in one gallon of water for use.

Example IV

0.030 pound of powdered phenoxyacetic acid and 0.030 pound of powdered paranitrophenol are intimately mixed with 0.935 pound of finely divided solid sodium chloride, and 0.005 pound of powdered sodium bisulfate.

The whole of this mixture is dissolved in one gallon of water for use.

Example V

0.050 pound of powdered phenoxyacetic acid are intimately mixed with 0.445 pound of powdered magnesium sulphate, 0.500 pound of powdered sodium chloride and 0.005 pound of powdered sodium bisulfate.

The whole of this mixture is dissolved in one gallon of water for use.

I claim:

1. A fungicidal composition comprising phenoxyacetic acid and a water soluble inorganic salt compatible in water solution with phenoxyacetic acid, the proportion of said salt in the composition greatly exceeding the proportion of phenoxyacetic acid in the composition, the said salt enhancing the fungicidal properties of the phenoxyacetic acid when the composition is dissolved in water to form a solution containing at least 2½ per cent concentration of the salt based upon the weight of the solution.

2. A fungicidal composition comprising phenoxyacetic acid and sodium chloride, the proportion of sodium chloride therein greatly exceeding the proportion of phenoxyacetic acid.

3. A fungicidal composition comprising phenoxyacetic acid, a water soluble inorganic salt compatible in water solution with phenoxyacetic acid, and another water soluble compatible acidic material for increasing the acidity of a water solution of the composition over and above the acidity provided by the phenoxyacetic acid, the proportion of said salt in the composition greatly exceeding the proportion of phenoxyacetic acid in the composition, the said salt enhancing the fungicidal properties of the phenoxyacetic acid when the composition is dissolved in water to form a solution containing at least 2½ per cent concentration of the salt based upon the weight of the solution.

4. A fungicidal composition comprising phenoxyacetic acid, paranitrophenol and a water soluble inorganic salt compatible in water solution with said phenoxyacetic acid and said paranitrophenol, the proportion of said salt in the composition greatly exceeding the proportions of phenoxyacetic acid and paranitrophenol in the composition, the said salt enhancing the fungicidal properties of the phenoxyacetic acid and the paranitrophenol when the composition is dissolved in water to form a solution containing at least 2½ per cent concentration of the salt based upon the weight of the solution.

5. A fungicidal composition for killing organisms causing athlete's foot comprising a solution

containing phenoxyacetic acid, water and a water soluble inorganic salt compatible in water solution with phenoxyacetic acid, the proportion of said salt in the composition greatly exceeding the proportion of phenoxyacetic acid in the composition, the said salt and water being present in the solution in such proportions as to provide an aqueous solution of said salt of at least 2½ per cent based upon the weight of the solution and said salt at said concentration enhancing the fungicidal properties of said phenoxyacetic acid.

6. A fungicidal composition for killing organ-

isms causing athlete's foot comprising a solution containing phenoxyacetic acid, water, and material selected from the group consisting of sodium chloride, sodium sulphate, potassium chloride, potassium sulphate, magnesium chloride, magnesium sulphate, calcium chloride, ammonium chloride and zinc chloride, the proportion of said material in the solution greatly exceeding the proportion of phenoxyacetic acid and being present in a concentration of at least 2½ per cent based upon the weight of the solution.

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