NOSB NATIONAL LIST
FILE CHECKLIST

LIVESTOCK

MATERIAL NAME: **#4 Copper Sulfate**

✓ **NOSB Database Form**

✓ **References**

____ **MSDS (or equivalent)**

✓ **TAP Reviews from:** **Lynn Brown, William Zimmer**

NOSB/NATIONAL LIST
COMMENT FORM
LIVESTOCK

Material Name: #4 Copper Sulfate

Please use this page to write down comments, questions, and your anticipated vote(s).

COMMENTS/QUESTIONS:

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1. In my opinion, this material is:
_____ Synthetic _____ Non-synthetic.

2. This material should be placed on the proposed National List as:
_____Prohibited Natural _____Allowed Synthetic.

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: Sept 5, 1995

Name of Material: Copper Sulfate

Reviewer Name: Lynn Brown

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

Synthetic

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

X Synthetic Allowed ____ Prohibited Natural

or, ____ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

Use according to directions.

Please comment on the accuracy of the information in the file:

Accurate information.

Any additional comments? (attachments welcomed)

Do you have a commercial interest in this material? ____ Yes; X No

Signature Lynn R Brown **Date** 8/31/95

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

Proper use should not pose any problems.

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

See database

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

Misuse of substance could cause soil contamination.

(4) the effect of the substance on human health;

No problem when used properly.

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

See database.

(6) the alternatives to using the substance in terms of practices or other available materials; and

alternative management systems are not adequate to control foot rot in many situations.

(7) its compatibility with a system of sustainable agriculture.

use of copper sulfate as a treatment and/or preventative for foot rot is compatible with sustainable agriculture

TAP REVIEWER COMMENT FORM for USDA/NOSB

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This file is due back to us by: Sept. 5, 1995

Name of Material: Copper Sulfate

Reviewer Name: William Zimmer D.V.M.

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

Synthetic

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

✓ **Synthetic Allowed** ___ **Prohibited Natural**

or, ___ **Non-synthetic (This material does not belong on National List)**

Are there any use restrictions or limitations that should be placed on this material on the National List? Yes

Animal use — Topically as a bactericide, especially for foot baths. Feeding at levels as a trace mineral source ~~[redacted]~~ (~ 10 - 30 ppm) of total diet. Higher levels are used by swine producers (>100 ppm) to reduce bacterial enteritis. This over supplementation to control disease may raise copper levels of organs such as the liver to higher than normal.

Please comment on the accuracy of the information in the file:

Any additional comments? (attachments welcomed)

Please further define or mention the practice of oversupplementing copper sulfate to act as an enteral bacteriostat. I question whether this practice meets the organic criteria due to the potential to accumulate larger than normal levels of copper in internal organs which may be consumed by humans. Potential of copper toxicity in humans would be very minimal.

Do you have a commercial interest in this material? ✓ **Yes;** ___ **No**

Signature William P. Zimmer DVM **Date** 9-7-95

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

minimal

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

over use or high (excessive) doses for controlling enteral bacteria in animals may cause accumulation in liver. Risk of copper toxicity in swine and cattle is minimal, in horses moderate, in sheep high. Risk to humans of such practice is minimal. High application rates to control soil fungi are questionable also as copper sulfate is very broad spectrum in its cidal effects.

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

Minimal from normal use. Foot baths and high use rates as a bacteriacide, fungicide, etc may cause ~~use~~ higher but still slight probability of environmental contamination. Some soils in South America show natural levels of copper at or above 20 pounds/acre with positive response to crops. what is toxic level?

(4) the effect of the substance on human health;

At low/normal levels copper sulfate would show positive effects on health, and copper is essential trace mineral.

Question excessive use in agriculture specifically diets of swine.

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

Copper and Sulfur are both required for life. Excessive levels have a broad spectrum bactericidal, fungalcidal and algacidal effect. Deficiency is fairly common in soils, plants, and animals. Copper Sulfate is very soluble, but readily bound in soil due to multivalent charge of Cu^{+2}.

(6) the alternatives to using the substance in terms of practices or other available materials; and

Topically - Zinc sulfate has some of same cidal effects for foot baths
Feed - only chelated copper compounds have a higher availability. Copper oxide has a poor availability to animals and has been abandoned as ineffective as a copper source for swine rations
Soil - no economical or effective alternatives, chelated copper can be used but is expensive!

(7) its compatibility with a system of sustainable agriculture.

Extremely compatible due to feed quality, storability, etc.
Inexpensive method of controlling topical infections and as a feed nutrient source.
Only the principle of feeding $CuSO_4$ at cidal levels is questioned.

NOSB Materials Database

Identification

Common Name **Copper Sulfate**

Chemical Name Cupric Sulfate Pentahydrate

Other Names Bluestone, Blue Vitriol

Code #: CAS 1332-14-5 (Copper Sulfate)

Code #: Other 1305-62-0 (Hydrated Lime)

N. L. Category Synthetic Allowed

MSDS yes

Chemistry

Family inorganic salt

Composition $CuSO_4$ & $Ca(OH)_2$

Properties Blue crystals, granules, or powder ($CuSO_4$). White powder, alkaline additive (Ca(OH)2)

How Made

Copper Sulfate is made by oxidizing copper turnings (from mining copper ore) in (special) furnaces in a current of air. The mass is then dissolved in sulfuric acid. and then purified. Hydrated lime is made by burning limestone gradually in a lime kiln and then adding the right amount of water.

Use/Action

Type of Use Livestock

Use(s) Health care. Foot bath for fungal and bacterial infection in large animals.

Action The toxic action of copper is attributed to its abiltiy to denature (change) the properties of cellular proteings and to deactivate enzyme systems in fungi and algae.

Combinations

Status

OFPA 6517 (c) (1) (B)(i) synthetic on list both as copper, sulfur, and livestock medicines.

N. L. Restriction Category 2

EPA, FDA, etc Regulatory priority would depend on its intended use.

Safety Guidelines

Directions

Registration

State Differences

Historical status OCIA approved.

Internationl status

OFPA Criteria

2119(m)1: chemical interactions

Corrosive to metals, incompatible with strong oxidizers, reacts vigorously with reducing agents. Solutions of sodium hypobromite are decomposed by catalytic action of cupric ions.

2119(m)2: toxicity & persistence

Breaks down into its components of calcium, sulfur, water, and copper easily in the soil. These are then adsorbed or recombined in the soil solution. Non-persistent as compounds, but copper itself is relatively immobile in soil and can persist and accumulate.

2119(m)3: manufacture & disposal consequences

2119(m)4: effect on human health

Chronic exposure- repeated ingestion of copper salts has produced hemolytic anemia, impaired immune response, liver, kidney, lung, and spleen damage and death in animals. Moderately acute toxicity to humans; LD50 (oral) 1000 mg/kg in rats. No carcinogen status, corrosive- eyes and ingestion; irritant- inhalation and skin. Acute toxicity if ingested, may cause gastroenteric pain, blue discoloration of bums and tongue, prostration, loss of consciousness, convulsions, may affect the liver, kidneys, and blood. The hazards are almost entirely associated with application and not with human consumption of any residues on food. Use of copper sulfate in drinking water of mice resulted in dose dependent impairment of the immune response.

2119(m)5: agroecosystem biology

Excess residues in manure or organic waste materials may accumulate in soils and effect microorganisms and earthworms. Copper forms a variety of inorganic and organic complexes in the soil environment. How soluble any of the copper is (and thus potentially phytotoxic) is dependent on pH, the amount of organic matter in the soil, and other factors. Some bacteria have evolved mechanisms to regulate copper uptade and resist copper toxicity. In addition, copper has been shown to accumulate in internal organs of large farm animals.

2119(m)6: alternatives to substance

Avoid high density confinement, keep confinement floors dry and clear of manure and other moist organic matter.

2119(m)7: Is it compatible?

References

McMurtry,-M.J., "Avoidance of sublethal doses of copper and zinc by tubificid oligochaetes." J-Great-Lakes-Res. [Toronto] : International Association for Great Lakes Research. 1984. v. 10 (3) p. 267-272.
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Miller,-W.P.; Martens,-D.C.; Zelazny,-L.W., "Short-term transformations of copper in copper-amended soils." J-Environ-Qual. Madison, Wis. : American Society of Agronomy. Apr/June 1987. v. 16 (2) p. 176-181.
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Wittenberg, K.M.; Boila, R.J.; Shariff, M.A., "Comparison of Copper Sulfate and Copper Proteinate as Copper Sources for Copper-Depleted Steers Fed High Molybdenum Diets." Can. J. Amin. Sci. 1990. v. 70: 895-904.

Cromwell, G.L.; Stahly, T.S.; Monegue, H.J., "High Levels of Copper Sulfate in Starter Diets for Pigs".