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FAO SPECIFICATIONS FOR PLANT PROTECTION PRODUCTS

COPPER AMMONIUM CARBONATE
COPPER CARBONATE BASIC
COPPER OXYCHLORIDE
COPPER SULFATE
CUPROUS OXIDE

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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Group on Pesticide Specifications

FAO Panel of Experts on Pesticide Specifications, Registration Requirements and Application Standards

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DISCLAIMER

FAO specifications are developed with the basic objective of ensuring, as far as possible, that pesticides complying with them are satisfactory for the purpose for which they are intended. However, the Group on Pesticide Specifications of the FAO Panel of Experts on Pesticide Specifications, Registration Requirements, Application Standards and Prior Informed Consent wishes to emphasize that, owing to the complexity of the problem involved, questions such as the suitability of pesticides for the control of a particular pest must be decided at national or provincial level. These specifications should not be assumed to be an endorsement of the use of a particular compound for a given purpose by either the Group of Experts or FAO.

Accordingly, neither the Food and Agriculture Organization of the United Nations (FAO) nor the members of the Group on Pesticide Specifications of the FAO Panel of Experts on Pesticide Specifications, Registration Requirements, Application Standards and Prior Informed Consent warrant that pesticides complying with these specifications are suitable for control of any given pest or for use in an particular area.

Furthermore, the preparation and use of pesticides complying with these specifications are not exempt from any safety regulation or other legal or regulatory provision applicable thereto. Neither FAO nor any member of the FAO Group of Experts shall be liable for any injury, loss, damage or prejudice of any kind that may be suffered as a result of the preparation or use of pesticides complying with these specifications.

Additionally, the Group of Experts wishes to warn users of specifications that improper field mixing and/or application of pesticides can result in either a lowering or complete loss of their efficacy. This holds true even in cases where such pesticides comply with the specifications indicated.

Accordingly, the Group of Experts and/or FAO can accept no responsibility for the consequences of improper field mixing and/or application.

INTRODUCTION

From time to time, FAO publishes booklets of specifications for technical materials and related formulations of plant protection products. Revisions of, and additions to, already published specifications will be issued when necessary, but during the interval between editions, revisions may be printed in the FAO Plant Protection Bulletin.

The specifications contained herein have been carefully reviewed and agreed by the Group on Pesticide Specifications of the FAO Panel of Experts on Pesticide Specifications, Registration Requirements and Application Standards after consultations with official government scientists, the pesticides industry through GIFAP (Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques) and, where appropriate, with individual manufacturers 1/.

FAO has published a Manual on the development and use of FAO and WHO Specifications for Plant Protection Products, FAO Plant Production and Protection Paper No. 173, Rome 2002 (Revised First Edition available only on the FAO home page of the http://www.fao.org/ag/agp/agpp/pesticid/)

This manual contains detailed definitions and other essential background information on basic procedures and technical principles adopted by the Group on Pesticide Specifications of the FAO Panel of Experts on Pesticide Specifications, Registration Requirements and Application Standards, such as:

1. Classes of Specifications.

- FAO (full) specifications (Code “S") Specifications that have all necessary requirements together with CIPAC (full) methods, or other collaboratively studied (proven) methods. 2/ and 3/.

- FAO Provisional specifications (Code (S)) are those for which more evidence of the necessary parameters is available and where some collaborative study of the methods of analysis has been carried out.

- FAO Tentative specifications (Code “ts") are those which have be recommended by FAO as preliminary specifications which are based on minimum requirements. The methods of analysis cited are normally supplied by the manufacturer or may already have been published or be the subject of collaborative work.

Wherever possible, standards for apparatus and common names for pesticides are those approved by the International Standards Organization. (ISO).

2. Expression of Active Ingredient Content

- for solids, liquid technical materials, volatile liquids (of maximum boiling point 50 C) and viscous liquids (with minimum kinematic viscosity of $10x10^2$ m^2/s at 20 C) the FAO Specification shall based on g/kg expression of content;

- for all other liquids the active ingredient content of the product shall be declared in terms of g/kg or g/l at 20 C. If the buyer requires both g/kg and g/l at 20°C, then, in case of dispute, the analytical results shall be calculated as g/kg.

3. Tolerance on Content.

A declared content of active ingredient must be included in all specifications, and one of the problems immediately arising is the level of tolerance acceptable above the nominal figures. The tolerance is influenced by (a) the reproducibility of the method of analysis, (b) the sampling error and (c) the manufacturing variance.

Allowable variations in analytical results (i.e., tolerances in content of active ingredient) with respect to specific pesticide consignments are intended to cover reasonable variations in content of active ingredient. For examples of such permitted tolerances, see the table on page 20 of the Manual.

4. Containers/Packaging.

Containers shall comply with pertinent national and international transport and safety regulations.

- Technical material, dustable powders and granules

  Containers shall be suitable, clean, dry and as specified, and shall not adversely affect, or be affected by, the product/material, but shall adequately protect it against external conditions.

- Wettable Powders

  The product shall be packed in suitable, clean, dry containers as specified in the order. The container shall provide all necessary protection against compaction, atmospheric moisture, oxidation, loss by vaporization and/or contamination to ensure that the product suffers no deterioration under normal transit and storage conditions.

  The product shall be protected by an adequate moisture barrier. This may be a suitable bag of polyethylene or alternative means of giving equal or better protection.

- Solutions and emulsifiable concentrates

  Containers shall be lined, where necessary, with a suitable material, or the interior surfaces treated to prevent corrosion and/or deterioration of the contents.

  Additional information should be given in all specifications where particular pesticides present problems in packaging.

5. Biological information.

- Phytotoxicity

  No test can be specified to cover possible phytotoxicity of formulation to all crops. When a crop is not mentioned in the instructions for use, purchasers should check with the supplier that the material is suitable, always provided that such a use is not restricted or legally forbidden.

- Wetting of crops

  The dilute spray should satisfactorily wet the leaves of the specified crops when used in accordance with the instructions. Test method MT 53.2, CIPAC 1, p. 965 may be useful.

1/ Should national pesticide specifications developed from these approved FAO specifications deviate fend them, the national Authority responsible for making such changes is requested to inform the FAO Plant Protection Service of the nature of and the reasons for the modifications.

2/ Methods or analysis and miscellaneous techniques referred to in these specifications have been developed and adopted by CIPAC (Collaborative International Pesticides Analytical Council Ltd.). See CIPAC Handbooks, 1 (1970), 1A (1980), 1B t1983), 1C (1985) and ID (1988), CIPAC Proceedings 1980 and 1981, obtainable from Black Bear Press Limited, King's Hedges Road, Cambridge CB4 2PQ, England. The page numbers of specific methods are given in brackets in the specifications. A copy of a method not yet published can be obtained from the FAO Plant Protection Service.

3/ Information on standard waters for laboratory evaluation of pesticidal formulations will be found in "CIPAC Monograph 1, Standard Waters and an FAO survey on Naturally Occurring Waters" (1972). Black Bear Press Limited, King's Hedges Road, Cambridge CB4 2PO, England.

SUBMISSION OF DRAFT SPECIFICATIONS TO FAO

Any organization, commercial firm or interested individual is encouraged to submit relevant specifications, or proposals for revision of existing specifications, for pesticide products for consideration and possible adoption by FAO. Correspondence should be addressed to the Pesticides Control Officer, Plant Production and Protection Division, FAO, Via delle Terme di Caracalla, 00100, Rome, Italy.

General guidelines in preparing draft specifications are given in the *Manual on the development and use of FAO and WHO Specifications for Plant Protection Products*, FAO Plant Production and Protection Paper No. 173, Rome 2002 (Revised First Edition available only on the FAO home page of the Internet at: http://www.fao.org/ag/agp/agpp/pesticid/)

Specifications which are considered suitable for further processing are assigned priorities and circulated to appropriate organizations and specialists to comment. Comments, together with other relevant information, are then reviewed in detail by the Group on Specifications of the FAO Panel of Experts on Pesticide Specifications, Registration Requirements, Application Standards and Prior Informed Consent. The drafts are converted into FAO Provisional Specifications, or full FAO Specifications.

COPPER AMMONIUM CARBONATE AQUEOUS SOLUTIONS

FAO Specification 44.4 NH_4ca/SL/S (1989)

.1 DESCRIPTION

The material shall consist of an aqueous solution containing copper ammonium carbonate as the active ingredient together with any necessary formulants. It shall be free from visible suspended matter and sediment.

.2 ACTIVE INGREDIENT

.2.1 Identity tests (CIPAC H, p. 96)

Where the identity of the active ingredient is in doubt, then it shall comply with at least one additional test.

.2.2 Total copper [CIPAC 1, 44.0/1/M1/1.2, p.226 (Referee method) or 44.0/1/M2/1.2, p.228]

The total copper content shall be declared (g/l at 20°C or g/kg) (Note 1) and when determined, the content obtained shall not differ from that declared by more than + 5% of the declared content.

.3 IMPURITIES

.3.1 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, p.1168)
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 2).

.3.2 Lead (MT 92, CIPAC 1A, p.1603)
Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.3 Cadmium 1/
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 4).

.3.4 Material insoluble in water 1/
Maximum: 3 g/l

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.4 STORAGE STABILITY

.4.1 Stability at O°C (MT 39.2, CIPAC 1, p.932)

After storage at 0 +/- 1°C (Note 5) for 7 days, there shall be no separation of extra matter from the material other than that found under .3.4.

Note 1 If the buyer requires both g/l at 20° and g/kg, then in case of dispute, the analytical results shall be calculated as g/kg.

Note 2 On a found content of 50 /kg copper, the maximum permitted amount of arsenic would be 0.1 x 50 = 5 mg/kg in the material.

Note 3 On a found content of 50 g/kg copper, the maximum permitted amount of lead would be 0.5 x 50 = 25 mg/kg in the material.

Note 4 On a found content of 50 /kg copper, the maximum permitted amount of cadmium would be 0.1 x 50 = 5 mg/kg in the material.

Note 5 When testing samples, ensure that variations of the temperature of the cold cabinet to not lead to some freezing at the container/solution interface.

CUPRIC CARBONATE BASIC TECHNICAL

FAO Specification 44.2ca/TC/S (1989)

.1 DESCRIPTION

The material shall consist of basic copper carbonate [$Cu(OH)_2.CuCO_3$] also known as cupric carbonate or malachite, together with related manufacturing impurities and shall be a green amorphous powder, free from visible matter and added modifying agents.

.2 ACTIVE INGREDIENT

.2.1 Identity tests (CIPAC H, p. 96)

Where the identity of the active ingredient is in doubt, then it shall comply with at least one additional test.

.2.2 Total copper [CIPAC 1, 44.0/1/M/1.2, p.226 (Referee method or 44.0/1/M2/1.2(c), p.230]

The total copper content shall be declared (not less than 550 g/kg) (Note 1), and when determined, the content obtained shall not differ from that declared by more than +/-10 g.

.3 IMPURITIES

.3.1 Copper soluble in water (MT 98, CIPAC 1B, p. l915)

Maximum: 20 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 2).

.3.2 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, P.1168)

Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.3 Lead (MT 92, CIPAC 1A, p. l603)

Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 4).

.3.4 Cadmium 1/

Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 5).

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

Note 1 Equivalent to a basic copper carbonate content of about 957 g/kg.

Note 2 On a found content of 550 g/kg copper, the maximum permitted amount of copper soluble in water would be 20 x 550 = 11000 mg/kg (11 g/kg) in the material.

Note 3 On a found content of 550 g/kg copper, the maximum permitted amount of arsenic would be 0.1 x 550 = 55 mg/kg in the material.

Note 4 On a found content of 550 g/kg copper, the maximum permitted amount of lead would be 0.5 x 550 = 275 mg/kg in the material.

Note 5 On a found content of 550 g/kg copper the maximum permitted amount of cadmium would be 0.1 x 550 = 55 mg/kg in the material.

COPPER OXYCHLORIDE TECHNICAL

(Basic Copper Chloride)
FAO Specification 44.2Oxch/TC/S (1989)

.1 DESCRIPTION

The material shall consist of copper oxychloride [$CuCl_2 3Cu(OH)_2$] together with related manufacturing impurities. It shall be a green to bluish-green powder, free from visible extraneous matter and added modifying agents.

.2 ACTIVE INGREDIENT

.2.1 Identity tests (CIPAC H, p. 96)

Where the identity of the active ingredient is in doubt, then it shall comply with at least one additional test.

.2.2 Total copper [CIPAC 1, 44.0/1/M1/1.2, p.226 (Referee method) or 44.0/1/M2/1.2(c), p.230 and CIPAC 1A, p. ll68]

The total copper content shall be declared (not less than 550 g/kg) (Note 1) and, when determined, the content obtained shall not differ from that declared by more than +/- 5.5 g.

.3 IMPURITIES

.3.1 Copper soluble in water (MT 98, CIPAC 1B, p.1915)
Maximum: 10 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 2).

.3.2 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, p.1168)
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.3 Lead (MT 92, CIPAC 1A, p.1603)
Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 4).

.3.4 Cadmium 1/
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 5).

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.3.5 Loss on drying (MT 17.3, CIPAC 1, p.874)
Maximum: 20 g/kg

.4 PHYSICAL PROPERTIES (Note 6)

***.4.1 Wet sieve test** (MT 59.3, CIPAC 1, p.981)
Maximum: 0.28 retained on a 45 µm test sieve.

***.4.2 Suspensibility 1/**
Not less than 80% of the material shall remain in suspension after 30 minutes in distilled water.

Note 1 Equivalent to a copper oxychloride content of about 924 g/kg.

Note 2 On a copper content of 570 g/kg, the maximum permitted copper soluble amount would be 10 x 570 = 5700 mg/kg (5.7 g/kg) in the material.

Note 3 On a copper content of 570 g/kg, the maximum permitted arsenic amount would be 0.1 x 570 = 57 mg/kg in the material.

Note 4 On a copper content of 570 g/kg, the maximum permitted lead content would be 0.5 x 570 = 285 mg/kg in the material.

Note 5 On a copper content of 570 g/kg, the maximum permitted cadmium amount would be 0.1 x 570 = 57 mg/kg in the material.

Note 6 If the technical material is to be used to produce wettable powders containing a minimum of 920 g/kg of copper oxychloride particles of 2.7 µm or less, then these tests are useful.

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* For information only.

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

COPPER OXYCHLORIDE DUSTABLE POWDERS

FAO Specification 44.20oxch/DP/S (1989)

.1 DESCRIPTION

The material shall consist of a homogeneous mixture of technical oxychloride [complying with the requirements of FAO Specification 44.2oxch/TC/S (1989)], together with carriers and any other necessary formulants. It shall be in the form of a fine, free-flowing powder, free from visible extraneous matter and hard lumps.

.2 ACTIVE INGREDIENT

.2.1 Identity tests 1 (CIPAC H, p. 96)

Where the identity of the active ingredient is in doubt, then it shall comply with at least one additional test.

.2.2 Total copper [CIPAC 1 44.0/2/M1/1.4, p.231 (Referee method) or 44.0/2/M2/l.4, p.232 and CIPAC 1A, p.1168]

The total copper content shall be declared (g/kg) and when determined, the content obtained shall not differ from that declared by more than +/- 10% of the declared content.

.3 IMPURITIES

.3.1 Copper soluble in water (MT 98, CIPAC 1B, p.1915)

Maximum: 10 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 1).

.3.2 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, p.1168)

Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 2).

.3.3 Lead (MT 92, CIPAC 1A, p.1603)

Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.4 Cadmium 1/

Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 4).

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.4 PHYSICAL PROPERTIES

.4.1 Dry sieve test (CIPAC 1, 44.0/2/M2/1.5, p.232)
Maximum: 28 retained on a 45 µm test sieve.

.4.2 Flowability (MT 44, CIPAC 1A, p.1567)
If required, maximum flow number: 12.

In the absence of proven methodology, this clause is for information only.

.5 STORAGE STABILITY

.5.1 Stability at 54°C (MT 46.1.1 , CIPAC 1, p . 951)
After storage at 54 +/- 2°C for 14 days, the product shall continue to comply with .4.1

Note 1 On a found content of 50 g/kg copper, the maximum permitted soluble copper amount would be 10 x 50 = 500 mg/kg in the material.

Note 2 On a found content of 50 g/kg copper, the maximum permitted amount of arsenic would be 0.1 x 50 = 5 mg/kg in the material.

Note 3 On a found content of 50 g/kg copper, the maximum permitted amount of lead would be 0.5 x 50 = 25 mg/kg in the material.

Note 4 On a found content of 50 g/kg copper, the maximum permitted amount of cadmium would be 0.1 x 50 = 5 mg/kg in the material.

COPPER OXYCHLORIDE WETTABLE POWDERS

FAO Specification 44.2oxch/WP/S (1989)

.1 DESCRIPTION

The material shall consist of a homogeneous mixture of technical oxychloride [complying with the requirements of FAO Specification 44 (1989)], together with filler(s) and any other necessary formulants be in the form of a fine powder, free from visible extraneous matter and hard lumps.

.2 ACTIVE INGREDIENT

.2.1 Identity tests 1 (CIPAC H, p. 96)

Where the identity of the active ingredient is in doubt, then it shall comply with at least one additional test.

.2.2 Total copper [CIPAC 1, 44.0/3/M1/1.4, p.236 (Referee method) or 44.0/3/M2/1.4, p.238 and CIPAC 1A, p.1170]

The total copper content shall be declared (g/kg) and when determined, the content obtained shall not differ from that declared by more than +/- 5% declared content.

.3 IMPURITIES

.3.1 Copper soluble in water (MT 98, CIPAC 1B, p.1915)
Maximum: 10 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 1).

.3.2 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, p.1168)
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 2).

.3.3 Lead (MT 92, CIPAC 1A, p.1603)
Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.4 Cadmium 1/
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 4).

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.4 PHYSICAL PROPERTIES

.4.1 pH range of aqueous dispersion (HT 75.2, CIPAC 1A, p.1590)
pH range: 6.0 to 9.5.

.4.2 Wet sieve test (MT 59.3, CIPAC 1, p.981)
Maximum: 1% retained on a 45 µm test sieve.

.4.3 Suspensibility (CIPAC 1, 44.0/3/Ml/1.7, p.236) (Notes 5 and 6)
A minimum of 80% of the copper content found under .2.2 shall be in suspension after 30 minutes in CIPAC Standard Water C.

Alternatively, if the buyer requires other CIPAC Standard Waters to be used then this shall be specified when ordering.

.4.4 Persistent foam (MT 47.2, CIPAC 1C, p.2249) (Note 7)
Maximum: 10 ml after 1 minute.

.4.5 Wetting of the product (MT 53.3.1, CIPAC 1, p.967)
The product shall be completely wetted in 1 minute without swirling.

.5 STORAGE STABILITY

.5.1 Stability at 54°C (MT 46.1.1, CIPAC 1, p.951)

After storage at 54 + 2°C for 14 days, the product shall continue to comply with .4.2 and .4.3.

Note 1 On a found content of 500 g/kg copper, the maximum permitted compound amount would be 10 x 500 = 5000 mg/kg (5 g/kg) in the material.

Note 2 On a found content of 500 g/kg copper, the maximum permitted amount of arsenic would be 0.1 x 500 = 50 mg/kg in the material.

Note 3 On a found content of 500 g/kg copper, the maximum permitted amount of lead would be 0.5 x 500 = 250 mg/kg in the material.

Note 4 On a found content of 500 g/kg copper, the maximum permitted amount of cadmium would be 0.1 x 500 = 50 mg/kg in the material.

Note 5 The product should be tested at the highest and lowest rates of use recommended by the supplier, provided this does not em conditions given in the method.

Note 6 This test will normally only be carried out after the stability test at 54°C (.5.1).

Note 7 The amount of sample to be used in the test should be specified at the highest rate of use recommended by the supplier.

CUPROUS OXIDE TECHNICAL
FAO Specification 44.lox/TC/S (1989)

.1 DESCRIPTION

The material shall consist of cuprous oxide technical [copper (1) oxide: Cu_2O], together with related manufacturing impurities and shall be an orange to red powder, free from visible extraneous matter. The material may contain stabilizing agents but no other modifying agents (Note 1).

.2 ACTIVE INGREDIENT

.2.1 Identity tests (CIPAC H, p. 96)

Where the identity of the active ingredient is in doubt, then it shall comply with at least one additional test.

.2.2 Total copper [CIPAC 1, 44.0/1/M1/1.2, p.226 (Referee method) or 44.0/1/M2/1.2(c), p.230 and CIPAC 1A, p.1168]

The total copper content shall be declared (not less than 820 g/kg) (Note 2) and, when determined, the content obtained shall not differ from that declared by more than +/- 20 g.

.2.3 Cuprous oxide (CIPAC H, p. 96)

The cuprous oxide content shall be declared (not less than 800 g/kg) and, when determined, the content obtained shall not differ from that declared by more than +/- 30 g.

.3 IMPURITIES

.3.1 Metallic copper 1/

Maximum: 50 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.2 Cupric copper 1/

Maximum: 100 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 4).

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.3.3 Copper soluble in water (MT 98, CIPAC 1B, p.1915)
Maximum: 25 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 5).

.3.4 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, p.1168)
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 6).

.3.5 Lead (MT 92, CIPAC LA, p.1603)
Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 7).

.3.6 Cadmium 1/
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 8).

.3.7 Loss on vacuum drying (MT 17.4, CIPAC 1, p.874)
Maximum: 15 g/kg.

Note 1 The content of any stabilizing agents present shall be declared.

Note 2 Equivalent to a Cu_2O content of 923 g/kg.

Note 3 On a found content of 820 g/kg total copper, the maximum permitted amount of metallic copper would be 50 x 820 = 41000 mg or 41 g/kg in the material.

Note 4 On a found content of 820 g/kg total copper, the maximum permitted amount of cupric copper would be 100 x 820 = 82000 mg or 82 g/kg in the material.

Note 5 On a found content of 820 g/kg total copper, the maximum permitted amount of copper soluble in water would be 25 x 820 = 20500 g/kg 20.5 g/kg in the material.

Note 6 On a found content of 820 g/kg total copper, the maximum permitted amount of arsenic would be 0.1 x 820 = 82 mg/kg in the material.

Note 7 On a found content of 820 g/kg total copper, the maximum amount of lead would be 0.5 x 820 = 410 mg/kg in the material.

Note 8 On a found content of 820 g/kg total copper, the maximum permitted amount of cadmium would be 0.1 x 820 = 82 mg/kg in the material.

CUPROUS OXIDE DUSTABLE POWDERS
FAO Specification 44.lox/DP/S (1989)

.1 DESCRIPTION

The material shall consist of a homogeneous mixture of technical cuprous oxide [complying with the requirements of FAO Specification 44.1ox/TC/S (1989)], together with carriers and any other necessary formulants. It shall be in the form of a fine, free-flowing powder, free from visible extraneous matter and hard lumps.

.2 ACTIVE INGREDIENT

.2.1 Identity tests (CIPAC H, p. 96)

Where the identity of the active ingredient is in doubt, then it shall comply with at least one additional test.

.2.2 Total copper [CIPAC 1, 44.0/2/M1/1.4 p.231 (Referee method) or 44.0/2/M2/1.4 p.232 and CIPAC 1A, p.1168]

The total copper content shall be declared (g/kg) and when determined, the content obtained shall not differ from that declared by more than the following amounts:

Declared content	Permitted tolerance
Up to 200 g/kg	+/- 10% of the declared content
Above 200 g/kg	+/- 20 g

.2.3 Cuprous oxide (CIPAC H, p. 96)

The content of cuprous oxide shall be declared (g/kg) and when determined, the content obtained shall not differ from that declared by more than the tolerance given in .2.2.

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.3 IMPURITIES

.3.1 Metallic copper 1/
Maximum: 50 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 1).

.3.2 Cupric copper 1/
Maximum: 120 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 2).

.3.3 Copper soluble in water (MT 98, CIPAC 1B, p.1915)
Maximum: 25 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.4 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, p.1168)
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 4).

.3.5 Lead (MT 92, CIPAC 1A, p.1603)
Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 5).

.3.6 Cadmium 1/
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 6).

.4 PHYSICAL PROPERTIES

.4.1 Dry sieve test (CIPAC 1, 44.0/2/M2/1.5, p.232)
Maximum: 2% retained on a 45 µm test sieve.

.4.2 Flowability (MT 44, CIPAC 1A, p.1567)

If required, maximum flow number: 12
In the absence of proven methodology, this clause is for information only.

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.5 STORAGE STABILITY

.5.1 Stability at 54°C (MT 46.1.1, CIPAC 1, p.951)

After storage at 54 +/- 2°C for 14 days, the product shall continue to comply with .4.1

Note 1 On a found content of 50 g/kg copper, the maximum permitted amount of metallic copper would be 50 x 50 = 2500 mg or 2.5 g/kg in the material.

Note 2 On a found content of 50 g/kg copper, the maximum permitted amount of cupric copper would be 120 x 50 = 6000 mg or 6 g/kg in the material.

Note 3 On a found content of 50 g/kg copper, the maximum permitted soluble copper amount would be 50 x 25 = 1250 mg or 1.25 g/kg in the material.

Note 4 On a found content of 50 g/kg copper, the maximum permitted amount of arsenic would be 0.1 x 50 = 5 mg/kg in the material.

Note 5 On a found content of 50 g/kg copper, the maximum permitted amount of lead would be 0.5 x 50 = 25 mg/kg in the material.

Note 6 On a found content of 50 g/kg copper, the maximum permitted amount of cadmium would be 0.1 x 50 = 5 mg/kg in the material.

CUPROUS OXIDE WETTABLE POWDERS

FAO Specification 44.1ox/UP/S (1989)

.1 DESCRIPTION

The material shall consist of a homogeneous mixture of technical oxide [complying with the requirements of FAO Specification 44.1ox/TC/5 together with filler(s) and any other necessary formulants. It shall be in the form of a fine powder, free from visible extraneous matter and hard lumps.

.2 ACTIVE INGREDIENT

.2.1 Identity tests (CIPAC H, p. 96)

Where the identity of the active ingredient is in doubt, then it shall comply with at least one additional test.

.2.2 Total copper [CIPAC 1, 44.0/3/K.1/1.4, p.236 (Referee method) or 44.0/3/M2/1.4, p.238 and CIPAC 1A, p.1170]

The total copper content shall be declared (g/kg) and when determined the content obtained shall not differ from that declared by more than +/-5% of the declared content.

.2.3 Cuprous oxide (CIPAC H, p. 96)

The cuprous oxide content shall be declared (g/kg) and when determined the content obtained shall not differ from that declared by more than +/-5% of the declared content.

.3 IMPURITIES

.3.1 Metallic copper 1/

Maximum: 50 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 1).

.3.2 Cupric copper 1/

Maximum: 120 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 2).

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.3.3 Copper soluble in water (MT 98, CIPAC 1B, p.1915)
Maximum: 25 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.4 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, p.1168)
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 4).

.3.5 Lead (MT 92, CIPAC 1A, p.1603)
Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 5).

.3.6 Cadmium 1/
Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 6).

.4 PHYSICAL PROPERTIES

.4.1 pH range of aqueous dispersion (MT 75.2, CIPAC 1A, p.1590)
pH range: 7.5 to 10.5.

.4.2 Wet sieve test (MT 59.3, CIPAC 1, p.981)
Maximum: 1% retained on a 45 µm test sieve.

.4.3 Suspensibility (CIPAC 1, 44.0/3/M1/1.7, p.236) (Notes 7 and 8)
A minimum of 80% of the copper content found under .2.2 shall be in suspension after 30 minutes in CIPAC Standard Water C.

Alternatively, if the buyer requires other CIPAC Standard Waters to be used, then this shall be specified when ordering.

.4.4 Persistent foam (MT 47.2, CIPAC 1C, p.2249) (Note 9)
Maximum: 10 ml after 1 minute.

1/ Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

.4.5 Wetting of the product (MT 53.3.1, CIPAC 1, p.967)

The product shall be completely wetted in 1 minute without swirling.

.5 STORAGE STABILITY

.5.1 Stability at 54°C (MT 46.1.1, CIPAC 1, p.951)

After storage at 54 +/- 2°C for 14 days, the product shall continue to comply with .4.2 and .4.3.

Note 1 On a found content of 400 g/kg copper, the maximum permitted metallic copper amount would be 50 x 400 = 20000 mg or 20 g/kg in the material.

Note 2 On a found content of 400 g/kg copper, the maximum permitted copper amount would be 120 x 400 = 48000 mg or 48 g/kg in the material.

Note 3 On a found content of 400 g/kg copper the maximum permitted copper amount would be 25 x 400 = 10000 mg or 10 g/kg in the material.

Note 4 On a found content of 400 g/kg copper, the maximum permitted amount of arsenic would be 0.1 x 400 = 40 mg/kg in the material.

Note 5 On a found content of 400 g/kg copper, the maximum permitted amount of lead would be 0.5 x 400 = 200 mg/kg in the material.

Note 6 On a found content of 400 g/kg copper, the maximum permitted amount of cadmium would be 0.1 x 400 = 40 mg/kg in the material.

Note 7 The product should be tested at the highest and lowest rates of use recommended by the supplier, provided this does not exceed the conditions given in the method.

Note 8 This test will normally only be carried out after the stability test at 54°C (.5.1).

Note 9 The amount of sample to be used in the test should be specified at the highest rate of use recommended by the supplier.

CUPRIC SULFATE TECHNICAL
FAO Specification 44.2s/TC/S (1989)

.1 DESCRIPTION

The material shall consist of cupric sulfate [copper (II) sulfate] pentahydrate together with related manufacturing impurities and shall be a blue crystalline material.

.2 ACTIVE INGREDIENT

.2.1 Identity tests

Where the identity of the active ingredient is in doubt, then it shall comply with the following tests.

.2.1.1 Colour change on heating

If the material is heated, then its colour should change from blue to white. After cooling, the addition of water should restore the blue colour.

.2.1.2 Sulfate

The material should give the reactions characteristic of a sulfate.

.2.2 Copper content (CIPAC 1, 44.0/1/M1/1.2, p.226 (Referee method) or 44.0/1/M2/1.2, p.228)

The copper content shall be declared (not less than 250 g/kg) (Note 1) and when determined, the content obtained shall not differ from that declared by more than 2.5 g/kg.

.3 IMPURITIES

.3.1 Arsenic (CIPAC 1A, 44.0/2/M2/2.6, p.1168)

Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 2).

.3.2 Lead (MT 92, CIPAC 1A, p.1603)

Maximum: 0.5 x X mg/kg, where X is the copper content (g/kg) found under .2.2 (Note 3).

.3.3 Cadmium 1/

Maximum: 0.1 x X mg/kg, where X is the copper content (g/kg) found under . 2.2 (Note 4).

Note 1 Equivalent to copper (II) sulfate pentahydrate of about 980 g/kg.

Note 2 On a copper content of 250 g/kg, the maximum permitted amount of arsenic should be 0.1 x 250 = 25 mg/kg in the material.

Note 3 On a copper content of 250 g/kg, the maximum permitted amount should be 0.5 x 250 = 125 mg/kg in the material.

Note 4 On a copper content of 250 g/kg, the maximum permitted a cadmium should be 0.1 x 250 = 25 mg/kg in the material .

1/ Method available from the Plant Protection officer FAO Plant Production and Protection Service.