

AGP: CP/239  
Supersedes AGP: CP/76

FAO SPECIFICATIONS  
FOR PLANT PROTECTION PRODUCTS

**DICHLORVOS**

2,2-dichlorovinyl dimethyl phosphate

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
Rome, 1989

Group on Pesticide Specifications

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

Technical Secretary: Dr. A.V. Adam  
Plant Protection Service  
Plant Production and Protection Division

FAO  
Via delle Terme di Caracalla  
00100 Rome, Italy - Telex: 610181 FAO I

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## **DISCLAIMER<sup>1</sup>**

FAO specifications are developed with the basic objective of promoting, as far as practicable, the manufacture, distribution and use of pesticides that meet basic quality requirements.

Compliance with the specifications does not constitute an endorsement or warranty of the fitness of a particular pesticide for a particular purpose, including its suitability for the control of any given pest, or its suitability for use in a particular area. Owing to the complexity of the problems involved, the suitability of pesticides for a particular purpose and the content of the labelling instructions must be decided at the national or provincial level.

Furthermore, pesticides which are manufactured to comply with these specifications are not exempted from any safety regulation or other legal or administrative provision applicable to their manufacture, sale, transportation, storage, handling, preparation and/or use.

FAO disclaims any and all liability for any injury, death, loss, damage or other prejudice of any kind that may arise as a result of, or in connection with, the manufacture, sale, transportation, storage, handling, preparation and/or use of pesticides which are found, or are claimed, to have been manufactured to comply with these specifications.

Additionally, FAO wishes to alert users to the fact that improper storage, handling, preparation and/or use of pesticides can result in either a lowering or complete loss of safety and/or efficacy.

FAO is not responsible, and does not accept any liability, for the testing of pesticides for compliance with the specifications, nor for any methods recommended and/or used for testing compliance. As a result, FAO does not in any way warrant or represent that any pesticide claimed to comply with a FAO specification actually does so.

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<sup>1</sup> This disclaimer applies to all specifications published by FAO.

## **INTRODUCTION TO FAO SPECIFICATIONS DEVELOPED UNDER THE OLD PROCEDURE**

Between 1975 and 2000, FAO published 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. However, all changes and revisions of FAO specifications are now subject to the new procedure described 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/>)

FAO specifications developed under the old procedure are based on the requirements defined in the Fourth Edition of the *Manual on the development and use of FAO specifications for plant protection products*, Plant Production and Protection Paper No. 128, Rome 1995.

This manual contained 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, Application Standards and Prior Informed Consent, 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 been 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  $1 \times 10^{-3} \text{ m}^2 / \text{s}$  at 20°C) the FAO Specification shall be 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.

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1/ Should national pesticide specifications developed from these approved FAO specifications deviate from 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 (1983), 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.

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## 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 Pesticide Management Group, Plant Production and Protection Division, FAO, Via delle Terme di Caracalla, 00153, Rome, Italy.

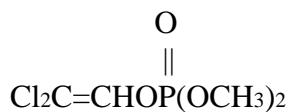
General guidelines in preparing draft specifications are given in the *Manual on the development and use of FAO and WHO Specifications for Plant Protection Products*, FAO Plant Production and Protection Paper No. 173, Rome 2002 (Revised First Edition available only on the FAO home page of the Internet 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.

## INFORMATION

COMMON NAME: Dichlorvos (ISO)

STRUCTURAL FORMULA:



EMPIRICAL FORMULA: C<sub>4</sub>H<sub>7</sub>Cl<sub>2</sub>O<sub>4</sub>P

RMM: 221.0

CAS REGISTRY NUMBER: (62-73-7)

CIPAC CODE NUMBER: 11

CHEMICAL NAME:

2,2-dichlorovinyl dimethyl phosphate (IUPAC)  
2,2- dichloroethenyl dimethyl phosphate (CA)

**DICHLORVOS TECHNICAL  
(For Crop Protection Use)**  
FAO Specification 11/TC/S (1989)

**.1 DESCRIPTION**

The material shall consist of dichlorvos together with related manufacturing impurities and shall be a colourless to light brown liquid free from visible extraneous matter and added modifying agents.

**.2 ACTIVE INGREDIENT**

**.2.1 Identity tests** (CIPAC P81, p.176, CIPAC H, p. 135)

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

**.2.2 Dichlorvos** (CIPAC P81, p.176 CIPAC H, p. 135)

The dichlorvos content shall be declared (not less than 970 g/kg) and, when determined, the content obtained shall not differ from that declared by more than +/- 20 g.

**.3 IMPURITIES**

**.3.1 Chloral** (CIPAC 1A, 11/1/M/1.4, p.1216)

Maximum: 5 g/kg

**.3.2 Water** (CIPAC 1A, 11/1/(M)/1.6, p.1218)

Maximum: 0.5 g/kg

**.4 PHYSICAL PROPERTIES**

**.4.1 Acidity** (MT 31.1.1, CIPAC 1, p.903 or 31.2.1 p.905)

Maximum acidity: 2 g/kg calculated as H<sub>2</sub>SO<sub>4</sub>

## **DICHLORVOS SOLUBLE CONCENTRATES**

Specification 11/SL/S (1989)

### **.1 DESCRIPTION**

The material shall consist of a solution of technical dichlorvos [complying with the requirements of FAO Specifications 11/TC/S (1989)] together with any necessary formulants. It shall be free from visible suspended matter and sediment.

### **.2 ACTIVE INGREDIENT**

#### **.2.1 Identity tests (CIPAC P81, p.176, CIPAC H, p. 135)**

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

#### **.2.2 Dichlorvos (CIPAC 1A, 11/4/(M)/1.4, p.1222)**

The dichlorvos content shall be declared (g/kg or g/l at 20 C, Note 1) and when determined, the content obtained shall not differ from that declared by more than the following amounts:

<u>Declared content</u>	<u>Permitted tolerance</u>
up to 500 g/kg or g/l	+/- 5% of the declared content
above 500 g/kg or g/l	+/- 25 g.

### **.3 IMPURITIES**

#### **.3.1 Water (MT 30.1, CIPAC 1, p.897)**

Maximum: 0.8 g/kg

## **.4 PHYSICAL PROPERTIES**

### **.4.1 Acidity or Alkalinity (MT 31.1.3, CIPAC 1, p.904 or MT 1.2.3, p.905) (Note 2)**

Maximum acidity: 5 g/kg calculated as H<sub>2</sub>SO<sub>4</sub>

Maximum alkalinity: 0.1 g/kg calculated as NaOH.

### **.4.2 Flash point (MT 12, CIPAC 1, p.846)**

If required, the flash point of the product shall not be lower than the minimum declared flash point. A closed cup method shall be used and the method stated (Note 3).

### **.4.3 Miscibility with water (MT 41, CIPAC 1, p.933)**

The product, after the stability test at 54°C (5.2) shall give a clear and homogeneous solution after dilution at 30°C, with CIPAC Standard Water C (Note 4).

## **.5 STORAGE STABILITY**

### **.5.1 Stability at 0°C (MT 39.1, CIPAC 1, p.930)**

After storage at 0 +/- 1°C for 7 days, the volume of solid and/or liquid which separates shall be not more than 0.3 ml.

### **.5.2 Stability at 54°C (MT 46.1.3, CIPAC 1, p.952)**

After storage at 54 +/- 2°C for 14 days, the product shall continue to comply with .2.2 (except that the minimum permitted dichlorvos content shall be 85% of that found under .2.2 and .4.1 (except that the maximum permitted acidity shall be 10 g/kg (Note 5).

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

Note 2 These methods have not been tested on this type of formulation but may be used as a starting point for further development.

Note 3 Attention is drawn to the appropriate national and international regulations on handling and transport of flammable materials.

Note 4 The concentration should not be higher than the highest concentration recommended in the instructions for use.

Note 5 The label should include a warning that the product should be stored in a cool, dry place.

**DICHLORVOS EMULSIFIABLE CONCENTRATES**  
FAO Specification 11/EC/S (1989)

**.1 DESCRIPTION**

The material shall consist of technical dichlorvos [complying with the requirements of FAO Specification 11/TC/S (1989)] dissolved in suitable solvents with any other necessary formulants. It shall be in the form of a stable liquid, free from visible suspended matter and sediment.

**.2 ACTIVE INGREDIENT**

**.2.1 Identity tests** (CIPAC P81, p.176, CIPAC H, p. 135)

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

**.2.2 Dichlorvos** (CIPAC 1A, 11/5/(M)/1.4, p.1223)

The dichlorvos content shall be declared (g/kg or 9/1 at 20°C, (Note 1) and when determined, the content obtained shall not differ from that declared by more than the following amounts:

<u>Declared content</u>	<u>Permitted tolerance</u>
up to 500 g/kg or g/l	+/- 5% of the declared content
above 500 g/kg or g/l	+/- 25 g.

**.3 IMPURITIES**

**.3.1 Water** (MT 30.1, CIPAC 1, p. 897)

Maximum: 1 g/kg

**.4 PHYSICAL PROPERTIES**

**.4.1 Acidity or Alkalinity** (MT 31.1.3, CIPAC 1, p.904 or MT 31.2.3, p.905)

Maximum acidity: 5 g/kg calculated as H<sub>2</sub>SO<sub>4</sub>

Maximum alkalinity: 0.1 g/kg calculated as NaOH.

#### **.4.2 Emulsion stability and re-emulsification [MT 36.2, CIPAC 1, p.914]**

After the heat stability test (.5.2) the product, when diluted 1% concentration with CIPAC Standard Waters A and C, at 30 C (Note 2) shall comply with the following:

<u>Time after dilution</u>	<u>Limits of stability</u>
0 h	Initial emulsification complete
0.5 h	80%
2.0 h	50%
24 h (Note 3)	Re-emulsification complete
24.5 h (Note 3)	80%

In special cases, a test using CIPAC Standard Waters A and C before the heat stability test may be necessary.

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

#### **.4.3 Flash point (MT 12, CIPAC 1, p.846)**

If required, the flash point of the product shall not be lower than the minimum declared flash point. A closed cup method shall be used and the method stated (Note 4).

### **.5 STORAGE STABILITY**

#### **.5.1 Stability at 0°C (MT 39.1, CIPAC 1, p.930)**

After storage at 0 +/- 1°C for 7 days, the volume of solid and/or liquid which separates shall not be more than 0.3 ml.

#### **.5.2 Stability at 54 C (MT 46.1.3, CIPAC 1, p.952)**

After storage at 54 +/- 2°C for 14 days, the product shall continue to comply with .2.2 (except that the minimum permitted dichlorvos content shall be 85% of that found under .2.2 and .4.1 (except that the maximum permitted acidity shall be 10g/kg (Note 5).

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

Note 2 Unless another temperature is specified.

Note 3 These tests need only be carried out in case of doubt as to the emulsion stability result of the 2 hour test.

Note 4 Attention is drawn to the appropriate national and international regulations on handling and transport of flammable materials.

Note 5 The label should include a warning that the product should be stored in a cool, dry place.