



Food and Agriculture Organization  
of the United Nations

AGP: CP/70

**FAO SPECIFICATIONS  
FAO PLANT PROTECTION PRODUCTS**

**BROMOPHOS**  
**4-bromo-2,5-dichloropheny1 dimethy1 phosphorothioate**

**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS**  
**Rome, 1977**

## 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 and Application Standards wishes to emphasize that, owing to the complexity of the problems 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, by either the Group of Experts or FAO, of the use of a particular compound for a given purpose.

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 and Application Standards warrants that pesticides complying with these specifications are suitable for the control of any given pest or for use in any particular area.

Furthermore, the preparation and use of pesticides complying with these specifications are not exempt from any safety regulation or other legal or administrative 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.

FAO specifications and relevant methods of analysis 1/, 2/ 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 Groupement International des Associations Nationales de Fabricants de Pesticides (GIFAP), and, where appropriate, with individual manufacturers.

Specifications are published either as FAO Specifications (i.e., acceptable on the basis of evidence presented), or FAO Provisional Specifications (i.e., usable, but requiring further work) 3/.

The clauses of the specifications are divided into “requirements” and “information”, the latter being indicated in the individual specifications by three asterisks. The information clauses provide the buyer with additional safeguards by indicating potential difficulties for which adoption of a definite requirement is not yet practicable.

Wherever possible, standards for apparatus and common names for pesticides are those approved by the International Standards Organization (ISO). Where such standards and names are not available, those recommended by the British Standards Institution (BSI) are used.

For solids, technical liquids, volatile liquids (of maximum boiling point 50°C and viscous liquids (with minimum viscosity of 1000 centipoises at 20°C) the FAO Specifications shall be based on a percent weight/weight expression of content. For all other liquids the active ingredient content of the product shall be declared in terms of grammes per litre at 20°C. The content may also be requested in terms of weight/weight and density.

In cases of dispute, however, where a user of the specifications has information on the content both in terms of g/l and w/w, the w/w value will be accepted as the correct statement of content.

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 during manufacture and also to compensate for possible inaccuracies in relevant methods of analysis. For examples of such permitted tolerances, see document mentioned in footnote 3/.

1/	Methods of analysis and miscellaneous techniques referred to in these specifications have been developed and adopted by Collaborative International Pesticides Analytical Council Ltd. (CIPAC). See CIPAC Handbook, Volume I (1970) and Volume IA (1977). W. Heffer & Sons Ltd., Cambridge, United Kingdom. Relevant references to specific methods in the Handbook are given in brackets in the specifications.
2/	Information on standard waters for laboratory evaluation of pesticidal formulations will be found in “CIPAC Monograph 1, Standard Waters and an FAO Survey of Naturally Occurring Waters” (1972). W. Heffer & Sons Ltd., Cambridge, United Kingdom.
3/	For 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, see “Manual on the Use of FAO Specifications for Plant Protection Products”, FAO, Rome, 1971. FAO Agricultural Development Paper No. 93.

## BROMOPHOS TECHNICAL

FAO Provisional Specification Code 5/1/(S)/4:

### 1. DESCRIPTION

The material shall consist, essentially, of bromophos, together with related manufacturing impurities, and shall be a light-coloured solid, free from extraneous materials and added modifying agents.

### 2. ACTIVE INGREDIENT

#### 2.1 Identity (CIPAC 1B, p. 1738)

It shall comply.

#### 2.2. Bromophos (CIPAC 1B, p. 1738)

##### 2.2.1 Minimum Content

Minimum: 95.0%.

##### 2.2.2. Declared Content

The bromophos content shall be declared and, when determined, the content obtained shall not differ from that declared by more than  $\pm 2$  percentage units.

#### 2.3 Melting Point (see CIPAC I, p.824, MT/2)

Minimum: 48°C.

### 3. IMPURITIES

#### 3.1 Acidity (Ibid., p.902, MT/31)

Maximum acidity: 0.3% calculated as H<sub>2</sub>SO<sub>4</sub>.

#### 3.2 Water Content (Ibid., p.897, MT/30.1)

Maximum 0.2%.

#### 3.3 Material insoluble in Acetone (Ibid., p.894, MT/27)

Maximum: 0.2%.

### 4. CONTAINERS

Containers shall be suitable, clean, dry and as specified in the order. They shall not affect, or be affected by, the product, but shall adequately protect it from external influences.

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

# BROMOPHOS DUSTS

FAO Provisional Specification Code 5/2/(S)/4:

## 1. DESCRIPTION

The product shall consist of a homogeneous mixture containing bromophos as the only active ingredient, together with suitable carriers and any necessary formulants. It shall be a fine, free-flowing, dustable powder, free from visible extraneous matter and hard aggregates, and shall be cream or grey in colour, unless otherwise agreed.

It shall be formulated from bromophos technical complying (see note 4) with the specification for "Bromophos Technical" (5.1.(S)/4).

## 2. ACTIVE INGREDIENT

### 2.1 Identity (CIPAC 1B, p. 1738)

It shall comply.

### 2.2 Bromophos (CIPAC 1B, p. 1738)

The bromophos content of the product shall be declared and, when determined, the content obtained shall not differ from that declared by more than the following amounts:

#### Declared Content

Up to 2.5%  
2.5% to 10%

#### Permitted Tolerance

± 15% of the declared content  
± 10% of the declared content

## 3. IMPURITIES

### 3.1 Acidity or Alkalinity (see CIPAC I, p.902, MT/31)

Maximum acidity: 0.3%, calculated as H<sub>2</sub>SO<sub>4</sub>.

Maximum alkalinity: 0.05%, calculated as NaOH.

## 4. PHYSICAL PROPERTIES

### 4.1 Dry Sieve Test (Ibid., p.978, MT/59.1)

Minimum: Not less than 95% of the product shall pass through a 75 µm test sieve.

Not more than (0.05 x x)% of the weight of the sample used for determination shall be present as bromophos in the residue on the 75µm test sieve, where x is the percentage of bromophos content declared under 2.2 (see note 1).

### 4.2 Flowability (Ibid., p.948, (MT)/44)

Maximum flow number: 15.

## 5. STORAGE STABILITY

### 5.1 Heat Stability (Ibid., p.951, MT/46.1.1)

After storage at  $34 \pm 1^{\circ}\text{C}$  for 14 days, the product shall continue to comply with 2.2, 3.1 and 4.1 (see note 2).

## 6. CONTAINERS

Containers shall be suitable, clean, dry as specified in the order. They shall not affect, or be affected by, the product, but shall adequately protect it from external influences.

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

## 7. BIOLOGICAL PROPERTIES

### \*\*\* 7.1 Phytotoxicity

At the present stage of our knowledge, no tests can be specified to cover phytotoxicity of formulations to crops.

When a certain crop is not specifically mentioned in the instructions for use, purchasers should check with the supplier to ensure that the material is suitable, always provided that the proposed use is not restricted or legally forbidden.

## BROMOPHOS DISPERSIBLE POWDERS

FAO Provisional Specification Code 5/3/(S)/4:

### 1. DESCRIPTION

The product shall consist of a homogeneous mixture containing bromophos as the only active ingredient, together with suitable carriers and any necessary formulants. It shall be a fine powder, free from visible materials and hard aggregates, and white to cream in colour, unless otherwise agreed.

It shall be formulated from bromophos technical complying with the specification for “Bromophos Technical” (5/1/(S)/4).

### 2. ACTIVE INGREDIENT

#### 2.1 Identity (CIPAC 1B, p. 1738)

It shall comply.

#### 2.2 Bromophos (CIPAC 1B, p. 1738)

The Bromophos content of the product shall be declared 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>
10% to 25%	± 6% of the declared content
25% to 50%	± 5% of the declared content

### 3. IMPURITIES

#### 3.1 Acidity or Alkalinity (see CIPAC I, p.902, MT/31)

Maximum acidity: 0.3%, calculated as H<sub>2</sub>SO<sub>4</sub>.

Maximum alkalinity: 0.05%, calculated as NaOH.

### 4. PHYSICAL PROPERTIES

#### 4.1 Wet Sieve Test (Ibid., p.981, MT/59.3)

Minimum: Not less than 98% of the product shall pass through a 75 µm test sieve.

#### 4.2 Suspensibility (Ibid., p.861m MT/15.1)

A minimum of 50% of the bromophos content declared under 2.2 shall be in suspension after 30 min in CIPAC Standard Water A, when determined on the product as received, and in CIPAC Standard Water C, after the Heat Stability Test.

Alternatively, if the buyer requires other CIPAC Standard Waters to be used, he should specify accordingly when ordering.



4.3 Wettability of the Powder (Ibid., p.966, MT/53.3)  
It shall be completely wetted in 2 min, without swirling.

4.4 Persistent Foam (Ibid., p.954, MT/47)  
Maximum: 25 ml of foam after 1 min.

## 5. STORAGE STABILITY

5.1 Heat Stability (Ibid., p.951 MT/46.1.1)  
After storage at  $34 \pm 1^{\circ}\text{C}$  for 14 days, the product shall continue to comply with 2.2, 3.1, 4.1 and 4.3 (see note 2)

## 6. CONTAINERS

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 with the container material, 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 shall be an inner bag of polyethylene (see note 3), or alternative means of giving equal or better protection.

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

## 7. BIOLOGICAL PROPERTIES

\*\*\* 7.1 Phytotoxicity  
At the present stage of our knowledge, no test can be specified to cover the Phytotoxicity of formulations to crops.

When a certain crop is not specifically mentioned in the instructions for use, purchasers should check with the supplier to ensure that the material is suitable, always provided that the proposed use is not restricted or legally forbidden.

\*\*\* 7.2 Wetting of Crops (Method 5/3/M/1.10; CIPAC 1B, p. 1742)  
The dilute spray shall satisfactorily wet the leaves of the specified crops when used in accordance with the instructions.

However, owing to wide variations in crops and pests, no specific figures can be assigned to wetting of crops, but this test may prove useful.

## BROMOPHOS SOLUTIONS

FAO Provisional Specification Code 5/4/(S)/3:

### 1. DESCRIPTION

The product shall consist of a solution, based on bromophos as the only active ingredient, together with any necessary formulants. The solution shall be free from visible suspended matter and sediment.

The bromophos contained in the product shall comply (see note 4) with the specification for “Bromophos Technical” (5/1/(S)/4).

### 2. ACTIVE INGREDIENTS

#### 2.1 Identity (CIPAC 1B, p. 1738)

It shall comply.

#### 2.2 Bromophos (CIPAC 1B, p. 1738)

The bromophos content shall be declared (% w/w and/or g/1 at 20°C) 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 10% <u>or</u> 100 g/1	± 10% of the declared content
Above 10% <u>or</u> 100 g/1	± 5% of the declared content

### 3. IMPURITIES

#### 3.1 Acidity or Alkalinity (see CIPAC I, p.902, MT/31)

Maximum acidity: 0.3%, calculated as H<sub>2</sub>SO<sub>4</sub>.

Maximum alkalinity: 0.05%, calculated as NaOH.

#### 3.2 Water content (Ibid., p.897, MT/30.1)

Maximum: 0.5%.

### 4. PHYSICAL PROPERTIES

#### 4.1 Flash Point (Ibid., p.846, MT/12)

The flash point of the product shall not be lower than the minimum declared flash point (see note 5). The procedure used shall be stated (e.g., Abel Method).

#### 4.2 Miscibility in Hydrocarbon Oil (Ibid., p.891, MT/23)

If required, the product shall be miscible in the appropriate hydrocarbon oil.

#### 4.3 Viscosity (Ibid., p.882, MT/22)

If required, the viscosity range of the product at 20°C shall be declared. The method used shall be stated.

## 5. STORAGE STABILITY

### 5.1 Low Temperature Stability (Ibid., p.909, MT/34)

After storage at 0°C (see note 6) for 7 days, the volume of solid and/or liquid which separates shall be not more than 0.3%.

### 5.2 Heat Stability Test (Ibid., p.951, MT/46.1.3)

After storage at  $54 \pm 2^\circ\text{C}$  for 14 days in a closed container, the product shall continue to comply with 2.2, 3.1 and 3.2.

## 6. CONTAINERS

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

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

## 7. BIOLOGICAL PROPERTIES

### \*\*\* 7.1 Phytotoxicity

At the present stage of our knowledge, no tests can be specified to cover phytotoxicity of formulations to crops.

When a certain crop is not specifically mentioned in the instructions for use, purchasers should check with the supplier to ensure that the material is suitable, always provided that the proposed use is not restricted or legally forbidden.

### \*\*\* 7.2 Wetting of Crops (Ibid., p.965, MT/53.2)

The dilute spray shall satisfactorily wet the leaves of the specified crops when used in accordance with the instructions.

However, owing to wide variations in crops and pests, no specific figures can be assigned to wetting of crops, but this test may prove useful.

## BROMOPHOS EMULSIFIABLE CONCENTRATES

FAO Provisional Specification Code 5/5/(S)/4:

### 1. DESCRIPTION

The product shall consist of an emulsifiable concentrate based on bromophos as the only active ingredient, together with suitable solvents and any necessary formulants. It shall be free from visible suspended matter and sediment.

The bromophos contained in the product shall comply (see note 4) with the specification for "Bromophos Technical" (5/1/(S)/4).

### 2. ACTIVE INGREDIENT

#### 2.1 Identity (Method 5/5/m/1.2; CIPAC 1B, p. 1742)

It shall comply.

#### 2.2 Bromophos (Method 5/5/(M)/1.4; CIPAC 1B, p. 1742)

The bromophos content shall be declared (% w/w and/or g/1 at 20 °C) 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 25% <u>or</u> 250 g/1	± 6% of the declared content
Above 25% <u>or</u> 250 g/1	± 5% of the declared content

### 3. IMPURITY

#### 3.1 Acidity or Alkalinity (see CIPAC I, p.902, MT/31)

Maximum acidity: 0.3%, calculated as H<sub>2</sub>SO<sub>4</sub>.

Maximum alkalinity: 0.05%, calculated as NaOH.

#### 3.2 Water Content (Ibid., p.897, MT/30.1)

Maximum: 0.5%.

#### 4. PHYSICAL PROPERTIES

##### 4.1 Emulsion Stability and Re-emulsification (Ibid., p.910, MT/36.1)

After the head Stability test (5.2), the product, when diluted at 30 °C (see note 7) with the specified CIPAC Standard Waters, shall comply with the following:

Time after Dilution	Limits of Stability
0 h	Initial emulsifiability: complete
0.5 h	Cream: maximum 2 ml
2.0 h	Cream: maximum 2 ml Free oil: nil
24.0 h	Re-emulsification: complete
24.5 h	Cream: maximum 4 ml Free oil: maximum 1 ml

The product shall be tested in Standard Water A and in Standard Water C, unless other CIPAC Standard Waters are specified.

##### \*\*\* 4.2 Flash Point (Ibid., p.846, MT/12)

The flash point of the product shall not be lower than the minimum declared flash point (see note 5). The procedure used shall be stated (e.g., Abel Method).

#### 5. STORAGE STABILITY

##### 5.1 Low Temperature Stability (Ibid., p.930, MT/39.1)

After storage at 0°C (see note 6) for 7 days, the volume of solid and/or liquid which separates shall be not more than 0.3%.

##### 5.2 Heat Stability (Ibid., p.952, MT/46.1.3)

After storage at 54 ± 2°C for 14 days, the concentrate shall continue to comply with 2.2, 3.1 and 4.1.

#### 6. CONTAINERS

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

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

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\*\*\* For information

## 7. BIOLOGICAL PROPERTIES

### \*\*\* 7.1 Phytotoxicity

At the present stage of our knowledge, no tests can be specified to cover phytotoxicity of formulations to crops.

When a certain crop is not specifically mentioned in the instructions for use, purchasers should check with the supplier to ensure that the material is suitable, always provided that the proposed use is not restricted or legally forbidden.

### \*\*\* 7.2 Wetting of Crops (Ibid., p.965, MT/53.2)

The dilute spray shall satisfactorily wet the leaves of the specified crops when used in accordance with the instructions.

However, owing to wide variations in crops and pests, no specific figures can be assigned to wetting of crops, but this test may prove useful.

## NOTES

1. If the dust contains a declared content of 5% bromophos and 20g of sample is used in the test, then the amount of bromophos in the residue on the test sieve should not exceed 0.05g, i.e.,

$$\frac{(0.05 \times x) \times \text{weight of sample}}{100} \quad \text{g}$$

2. The container labels should include a warning that this material should be stored in a cool place and not above 30°C.
3. Because of variation in the nature and size of the container, its destination and other factors, it is not possible to specify the thickness of the polyethylene, but as a guideline, for a container with 50 kg of product, the inner liner should be not less than 0.075 mm thick.
4. See p.8, section 5.2 of document mentioned in footnote 3 in Introduction.
5. Attention is drawn to the appropriate national and international regulations concerning handling and transport of flammable materials.
6. A test temperature of 0°C may not be suitable for products intended for use in cold climates and, in such cases, an alternative test temperature may be specified.
7. Unless another temperature is specified.

## SUBMISSION OF DRAFT SPECIFICATIONS TO FAO

Any organization, commercial firm or interested individual may submit relevant specifications for consideration and possible adoption by FAO. Correspondence should be addressed to 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 “Manual on the Use of FAO Specifications for Plant Protection Products”, FAO, Rome, 1971. FAO Agricultural Development Paper No.93.

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