

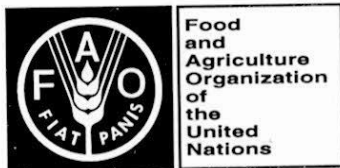
FAO SPECIFICATIONS FOR PLANT PROTECTION PRODUCTS

INSECTICIDES

ACEPHATE
CYFLUTHRIN

HERBICIDES

BROMOXYNIL
BROMOXYNIL HEPTANOATE
BROMOXYNIL OCTANOATE
DIQUAT DIBROMIDE
IOXINIL
IOXINIL OCTANOATE
PARAQUAT DICHLORIDE



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ACEPHATE (AGP: CP/336)
CYFLUTHRIN (AGP: CP/337)

HERBICIDES

BROMOXYNIL (AGP: CP/338)
BROMOXYNIL HEPTANOATE (AGP: CP/339)
BROMOXYNIL OCTANOATE (AGP: CP/340)
DIQUAT DIBROMIDE (AGP: CP/341)
IOXINIL (AGP: CP/342)
IOXINIL OCTANOATE (AGP: CP/343)
PARAQUAT DICHLORIDE (AGP: CP/344)

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 1996

CONTENTS

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DISCLAIMER	v
INTRODUCTION	vii
SUBMISSION OF DRAFT SPECIFICATIONS TO FAO	xi
ACEPHATE	1
Technical concentrates	3
Water soluble powders	5
CYFLUTHRIN	9
Technical concentrates	11
Wettable powders	13
Emulsifiable concentrates	15
Ultra low volume liquids	18
Emulsions, oil in water	20
BROMOXYNIL	23
Technical concentrates	25
BROMOXYNIL HEPTANOATE	27
Technical concentrates	29
Emulsifiable concentrates	31
BROMOXYNIL OCTANOATE	35
Technical concentrates	37
Emulsifiable concentrates	39
DIQUAT DIBROMIDE	43
Technical concentrates	45
Aqueous solutions	47
Diquat dibromide - paraquat dichloride aqueous solutions	49
IOXYNIL	53
Technical concentrates	55
IOXYNIL OCTANOATE	57
Technical concentrates	59
Emulsifiable concentrates	61

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.....	65
.....	67
.....	69

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 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 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 a pesticide 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.

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, Application Standards and Prior Informed Consent after consultations with official government scientists, the pesticides industry through GIFAP (Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques or, in English, International Group of National Associations of Manufacturers of Agrochemical Products) and, where appropriate, with individual manufacturers.¹

FAO has published a *Manual on the development and use of FAO Specifications for Plant Protection Products*, FAO Plant Production and Protection Paper No. 128, Rome 1995 (available in English, French and Spanish from the FAO Plant Protection Service).

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, Application Standards and Prior Informed Consent, such as:

1. Categories of Specifications (Section 3.1 of the Manual)

FAO Tentative Specifications (Code 'S/T', formerly 'ts') are those which have been recommended by FAO as preliminary specifications and 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.

FAO Provisional Specifications (Code 'S/P', formerly '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 (full) Specifications (Code 'S/F', formerly 'S').

Specifications that have all necessary requirements together with CIPAC (full) methods, or other collaboratively studied (proven) methods.^{2,3}

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

2. Expression of active ingredient content (Section 4.2.5 of the Manual)

- 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 expression of the content as g/kg;
- 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 customer 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 (Section 4.2.7 of the Manual)

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 about the nominal figure. 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 the contents of active ingredients. For examples of such tolerances, see the table in Section 4.2.7 of the Manual.

4. Containers/packaging

FAO guidelines are in preparation.

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

Technical materials, dustable powders and granules

Containers shall be suitable, clean, dry and as specified, and shall not adversely affect, or be affected by, the contents, but shall adequately protect them 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, 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 shall be 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 the possible phytotoxicity of a 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 F, p.162, may be useful.

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 of 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), D (1988), E (1993), 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 parentheses in the specifications. Copies of methods 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, 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, Viale delle Terme di Caracalla, 00100 Rome, Italy.

General guidelines on preparing draft specifications are given in Plant Production and Protection Paper 128, *Manual on the Development and Use of FAO Specifications for Plant Protection Products, Fourth Edition*, FAO, Rome, 1995 (available in English, French and Spanish).

Specifications which are considered suitable for further processing are assigned priorities and circulated to appropriate organizations and specialists for 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.

ACEPHATE

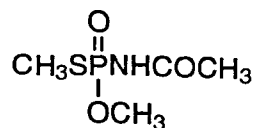
O,S-dimethyl acetylphosphoramidothioate



INFORMATION

COMMON NAME: acephate (ISO)

STRUCTURAL FORMULA:



EMPIRICAL FORMULA: $\text{C}_4\text{H}_{10}\text{NO}_3\text{PS}$

RMM: 183.2

CAS REGISTRY NUMBER: 30560-19-1

CIPAC CODE NUMBER: 338

EEC NUMBER: 015-079-00-7

CHEMICAL NAMES: *O,S*-dimethyl acetylphosphoramidothioate (IUPAC)
N-[methoxy(methylthio)phosphinoyl]acetamide (CA)

ACEPHATE TECHNICAL

FAO Specification 338/TC/S/P (1995)

1. DESCRIPTION

The material shall consist of acephate together with related manufacturing impurities and shall be a white crystalline powder with a strong mercaptan-like odour. The material shall be free from visible extraneous matter and added modifying agents.

2. ACTIVE INGREDIENT

2.1 Identity test¹

An identity test is required if the identity of the active ingredient is in doubt.

Acephate (AOAC-CIPAC method, not yet published)¹

The acephate content shall be declared (not less than 990 g/kg) and, when determined, the content obtained shall not differ from that declared by more than ± 10 g/kg.

3. IMPURITIES

3.1 Methamidophos¹

Maximum: 5.0 g/kg.

3.2 *O,O,S*-trimethyl phosphorothioate¹

Maximum: 1.0 g/kg.

3.3 Acetamide¹

Maximum: 1.0 g/kg.

3.4 Water (MT. 30, CIPAC F, p.91)

Maximum: 2 g/kg (Note 1).

¹Methods available from the Pesticides Information Officer, FAO Plant Production and Protection Division.

4. PHYSICAL PROPERTIES

4.1 pH range (MT 75, CIPAC F, p.205)

pH range: 3.4 to 3.6.

4.2 Melting range (MT 2, CIPAC F, p.5)

Melting range: 88-90°C.

NOTES

1. Typically the water content is about 1.5 g/kg. However, as acephate technical is hygroscopic, care must be taken to package it in moisture-proof containers and store in a dry location.

ACEPHATE WATER SOLUBLE POWDERS

FAO specification 338/SP/S/P (1995)

1. DESCRIPTION

The material shall consist of a homogeneous mixture of technical acephate, complying with the requirements of FAO specification 338/TC/S/P (1995), together with any necessary formulants. It shall be in the form of a powder to be applied as a true solution of the active ingredient after dissolution in water but which may contain insoluble inert ingredients.

2. ACTIVE INGREDIENT

2.1 Identity test¹

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Acephate (AOAC-CIPAC method, not yet published)¹

The acephate content shall be declared (g/kg) 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	± 5% of the declared content
Above 500 g/kg	± 25 g/kg.

3. IMPURITIES

3.1 Methamidophos¹

Maximum: 0.5% of the acephate content found under 2.2.

3.2 O,O,S-trimethyl phosphorothioate¹

Maximum: 0.1% of the acephate content found under 2.2.

¹ Methods available from the Pesticides Information Officer, FAO Plant Production and Protection Division

3.3 Acetamide¹

Maximum: 0.1% of the acephate content found under 2.2.

3.4 Water content (MT 30, CIPAC F, p.91)

Maximum: 20 g/kg.

3.5 Material insoluble in water (MT10, CIPAC F, p.27)

Maximum: 220 g/kg.

4. **PHYSICAL PROPERTIES**4.1 pH range (MT 75.2, CIPAC F, p.206)

pH range: 3.5 to 3.8.

4.2 Wet sieve test (MT 59.3, CIPAC F, p.179)

Maximum: 2% retained on a 75 µm test sieve.

4.3 Rate of dissolution and solution stability (CIPAC MT 60, CIPAC F, p.182)

After 5 minutes: opaque suspension with slight settling of particles (< 1.0 ml) and no large particles observed.

After 18 hours: 4.5 ml of fine white particulate sediment and 95.5 ml of translucent supernatant containing very fine suspended particles.

4.4 Wetting of the material (MT 53.3.1, CIPAC F, p.164)

The product shall be completely wetted in less than 1 min without swirling.

5. **STORAGE STABILITY**5.1 Stability at 54°C (MT 46.1.1, CIPAC F, p.149)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days, the determined average active ingredient content must not be lower than 97% relative to the determined average content found before storage (Note 1) and the product shall continue to comply with 3.1, 4.1, 4.3 and 4.4.

¹ Method available from the Pesticides Information Officer, FAO Plant Production and Protection Division

NOTES

1. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

CYFLUTHRIN

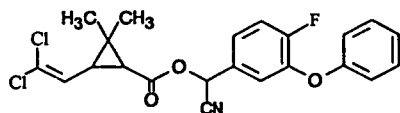
(*RS*)- α -cyano-4-fluoro-3-phenoxybenzyl (*1RS*)-*cis-trans*-3-(2,2-dichlorovinyl)
-2,2-dimethylcyclopropanecarboxylate



INFORMATION

COMMON NAME: cyfluthrin (ISO)

STRUCTURAL FORMULA:

EMPIRICAL FORMULA: $C_{22}H_{18}Cl_2FNO_3$

RMM: 434.3

CAS REGISTRY NUMBER: 68359-37-5

CIPAC CODE NUMBER: 385

CHEMICAL NAMES:

(RS)- α -cyano-4-fluoro-3-phenoxybenzyl (1RS,3RS;1RS,3SR)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (IUPAC)(RS)- α -cyano-4-fluoro-3-phenoxybenzyl (1RS)-cis-trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (Rothamsted)

Cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate (CA)

CYFLUTHRIN TECHNICAL

FAO Specification 385/TC/S/F (1995)

1. DESCRIPTION

The material shall consist of cyfluthrin together with related manufacturing impurities and shall be a viscous brown oil (which may partially be crystallized; Note 1), free from visible extraneous matter and added modifying agents.

2. ACTIVE INGREDIENT

2.1 Identity tests (385/TC/M/2, CIPAC H, to be published)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Cyfluthrin (385/TC/M/3, CIPAC H, to be published)

The cyfluthrin content shall be declared (not less than 920 g/kg) and, when determined, the content obtained shall not differ from that declared by more than ± 25 g/kg.

2.3 Ratio of Isomers (385/TC/M/3, CIPAC H, to be published)

Cyfluthrin is a mixture of four diastereoisomers and the ratio of each of the diastereoisomers to their sum shall be:

Diastereoisomer I	(1R,3R, α R + 1S,3S, α S = 1:1; cis):	23-27%
Diastereoisomer II	(1R,3R, α S + 1S,3S, α R = 1:1; cis):	17-21%
Diastereoisomer III	(1R,3S, α R + 1S,3R, α S = 1:1; trans):	32-36%
Diastereoisomer IV	(1R,3S, α R + 1S,3R, α S = 1:1; trans):	21-25%

(Increasing HPLC retention time from diastereoisomer I to IV).

3. IMPURITIES

3.1 Water (MT 30.1, CIPAC F, p.91)

Maximum: 1.0 g/kg.

4. PHYSICAL PROPERTIES

4.1 Acidity/alkalinity (MT 31.1, CIPAC F, p.96)

Maximum acidity: 1.0 g/kg calculated as H₂SO₄
Maximum alkalinity: 1.0 g/kg calculated as NaOH

NOTES

1. *Before sampling, heat the contents of the container to 80°C to dissolve any crystallized active ingredient, and homogenize by appropriate shaking.*

CYFLUTHRIN WETTABLE POWDERS

FAO Specification 385/WP/S/F (1995)

CAUTION: *The use of hard water may create suspensibility problems.*

1. DESCRIPTION

The material shall consist of a homogeneous mixture of technical cyfluthrin, complying with the requirements of FAO specification 385/TC/S/F (1995), 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 (385/TC/M/2, CIPAC H, to be published)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Cyfluthrin (385/TC/M/3, CIPAC H, to be published)

The cyfluthrin content shall be declared (g/kg) 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>
25 up to 100 g/kg	±10% of the declared content
Above 100 up to 250 g/kg	± 6% of the declared content

3. IMPURITIES

3.1 Water (MT 30.1, CIPAC F, p.91)

Maximum: 35 g/kg.

4. PHYSICAL PROPERTIES

4.1 Wet sieve test (MT 59.3, CIPAC F, p.179)

Maximum: 2% retained on a 75 µm test sieve.

4.2 Suspensibility (MT 15.1, CIPAC F, p.45. Notes 1 and 2)

A minimum of 70% of the cyfluthrin content found under 2.2 shall be in suspension after 30 min in CIPAC Standard Water D (Note 3) at 30°C. Alternatively, if the buyer requires other CIPAC Standard Waters to be used, then this shall be specified when ordering.

4.3 Persistent foam (MT 47.2, CIPAC F, p.152. Note 4)

Maximum: 10 ml after 1 min.

4.4 Wetting of the product (MT 53.3.1, CIPAC F, p.165)

The product shall be completely wetted in 2 min without swirling.

5. **STORAGE STABILITY**

5.1 Stability at 54°C (MT 46.1.1, CIPAC F, p.149)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days (Note 5), the determined average active ingredient content must not be lower than 95% relative to the determined average content found before storage (Note 6) and the product shall continue to comply with 4.1 and 4.2.

NOTES

1. *The product should be tested at the highest and lowest rates of use recommended by the supplier, provided this is consistent with the conditions given in method MT 15.1.*
2. *This test will normally be carried out only after the heat stability test 5.1.*
3. *The use of CIPAC Standard Water C results in a flocculation of the suspension which has not been notified by customers using natural waters under practical conditions of application.*
4. *The mass of sample to be used in the test should correspond to the highest rate of use recommended by the supplier.*
5. *Unless other temperatures and/or times are specified.*
6. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

CYFLUTHRIN EMULSIFIABLE CONCENTRATES

FAO Specification 385/EC/S/F (1995)

1. **DESCRIPTION**

The material shall consist of technical cyfluthrin, complying with the requirements of FAO specification 385/TC/S/F (1995), dissolved in suitable solvents together 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 (385/TC/M/2, CIPAC H, to be published)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Cyfluthrin (385/TC/M/3, CIPAC H, to be published)

The cyfluthrin 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 25 g/kg or g/l	$\pm 15\%$ of the declared content
Above 25 up to 100 g/kg or g/l	$\pm 10\%$ of the declared content
Above 100 up to 250 g/kg or g/l	$\pm 6\%$ of the declared content

3. **IMPURITIES**

3.1 Water (MT 30.1, CIPAC F, p.91)

Maximum: 3.0 g/kg.

4. **PHYSICAL PROPERTIES**

4.1 Acidity/alkalinity (MT 31.1, CIPAC F, p.96)

Maximum acidity: 3.0 g/kg calculated as H_2SO_4 .
Maximum alkalinity: 0.1 g/kg calculated as NaOH.

4.2 Emulsion stability and re-emulsification (MT 36.1.1, CIPAC F, p.108. Note 2)

After the heat stability test the product, when diluted at 30°C (Note 3) with CIPAC Standard Waters A and C, shall comply with the following:

<u>Time after dilution</u>	<u>Limits of stability</u>
0 h	Initial emulsification: complete
0.5 h	"Cream", maximum: 1 ml
2.0 h	"Cream", maximum: 2 ml "Free oil", maximum: 0 ml
24 h (Note 4)	Re-emulsification: complete
24.5 h (Note 4)	"Cream", maximum: 1 ml "Free oil", maximum: 0 ml

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 F, p.31. Note 5)

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.

5. STORAGE STABILITY

5.1 Stability at 0°C (MT 39.1, CIPAC F, p.128)

After storage at $0 \pm 1^\circ\text{C}$ for 7 days (Note 6), the volume of the 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 F, p.150)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days (Note 7), the determined average active ingredient content must not be lower than 98% relative to the determined average content found before storage (Note 7) and the product shall continue to comply with 4.1 and 4.2.

NOTES

1. *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.*
2. *This test will normally be carried out only after the heat stability test .5.2.*

3. *Unless another temperature is specified.*

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

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

6. *Unless other temperatures and/or times are specified.*

7. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

CYFLUTHRIN ULTRA LOW VOLUME LIQUIDS

FAO Specification 385/UL/S/F (1995)

1. DESCRIPTION

The material shall consist of technical cyfluthrin, complying with the requirements of FAO specification 385/TC/S/F (1995), together with any 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 (385/TC/M/2, CIPAC H, to be published)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Cyfluthrin (385/TC/M/3, CIPAC H, to be published)

The cyfluthrin 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 25 g/kg or g/l	± 15% of the declared content
Above 25 up to 100 g/kg or g/l	± 10% of the declared content
Above 100 up to 250 g/kg or g/l	± 6% of the declared content

3. IMPURITIES

3.1 Water (MT 30.1, CIPAC F, p.91)

Maximum: 2.0 g/kg.

4. PHYSICAL PROPERTIES

4.1 Acidity/alkalinity (MT 31.1, CIPAC F, p.96)

Maximum acidity: 2.0 g/kg calculated as H₂SO₄.

Maximum alkalinity: 0.1 g/kg calculated as NaOH

4.2 Flash point (MT 12, CIPAC F, p.31. Note 2)

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.

4.3 Kinematic viscosity range (MT 22, CIPAC F, p.75)

If required, the kinematic viscosity range of the product at 20°C shall be declared and, if determined, shall not differ from that declared by more than ± 20%. The method used shall be stated.

5. STORAGE STABILITY

5.1 Stability at 0°C (MT 39.1, CIPAC F, p.128)

After storage at 0 ± 1°C (Note 3) 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 F, p.150)

After storage at 54 ± 2°C for 14 days (Note 3), the determined average active ingredient content must not be lower than 98% relative to the determined average content found before storage (Note 4) and the product shall continue to comply with 4.1.

NOTES

1. 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.
2. Attention is drawn to the appropriate national and international regulations on the handling and transport of flammable materials.
3. Unless other temperatures and/or times are specified.
4. Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.

CYFLUTHRIN EMULSIONS, OIL IN WATER

FAO Specification 385/EW/S/F (1995)

1. DESCRIPTION

The product shall consist of an emulsion of technical cyfluthrin, complying with the requirements of FAO specification 385/TC/S/F (1995), in an aqueous phase together with suitable formulants. After gentle agitation the product shall be homogeneous (Note 1) and suitable for dilution in water.

2. ACTIVE INGREDIENT

2.1 Identity tests (385/TC/M/2, CIPAC H, to be published)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Cyfluthrin (385/TC/M/3, CIPAC H, to be published)

The cyfluthrin content shall be declared (g/kg or g/l at 20°C. Note 3) 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 g/kg or g/l	± 15% of the declared content
Above 25 up to 100 g/kg or g/l	± 10% of the declared content
Above 100 up to 250 g/kg or g/l	± 6% of the declared content

3. IMPURITIES

Not relevant.

4. PHYSICAL PROPERTIES

4.1 Mass per millilitre at 20°C (MT 3.3, CIPAC F, p.18)

If required, the mass per millilitre (g/l) at 20°C shall be declared.

4.2 pH range (MT 75, CIPAC F, p.205)

pH range: 3 to 5.

4.3 Pourability (MT 148, CIPAC F, 348)

"Rinsed residue": maximum 0.5%.

4.4 Wet sieve test (Method under consideration)

Maximum: 2% retained on a 75 µm test sieve.

4.5 Emulsion stability and re-emulsification (MT 36.1.1, CIPAC F, p.108. Note 3)

After the heat stability test (5.2), the product, when diluted at 30°C (Note 4) with CIPAC Standard Waters A and C, shall comply with the following:

<u>Time after dilution</u>	<u>Limits of stability</u>
0 h	Initial emulsification: complete
0.5 h	"Cream", maximum: 0 ml
2.0 h	"Cream", maximum: 0 ml
	"Free oil", maximum: 0 ml
24 h (Note 5)	Re-emulsification: complete
24.5 h (Note 5)	"Cream", maximum: 0 ml
	"Free oil", maximum: 0 ml

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

4.6 Persistent foam (MT 47, CIPAC F, p.152. Note 6)

Maximum: 0 ml after 1 min.

4.7 Flash point (MT 12, CIPAC F, p.31. Note 7)

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.

5. STORAGE STABILITY

5.1 Stability at 0°C (MT 39.1, CIPAC F, p.128)

After storage at 0 ± 1°C for 7 days (Note 8), the product shall comply with 4.4 (Note 9). No separation of oily matter shall be visible after gentle agitation.

5.2 Stability at 54°C (MT 46.1.3, CIPAC F, p.150)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days (Note 8), the determined average active ingredient content must not be lower than 98% relative to the determination average content before storage (Note 10) and the product shall continue to comply with 4.2, 4.3 and 4.4.

NOTES

1. *All physical and chemical tests listed in this specification are to be performed with a laboratory sample taken after the recommended homogenisation procedure. Before sampling to verify the product quality, the commercial container must be inspected carefully. On standing, emulsions may develop a concentration gradient which could even result in the appearance of a clear liquid on the top (sedimentation of the emulsion) or on the bottom (creaming up of the emulsion). Therefore, before sampling, the product must be homogenised according to the instructions given by the manufacturer or, in the absence of such instructions, by gentle shaking of the commercial container (for example, by inverting the closed container several times).*
2. *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.*
3. *This test will normally be carried out only after the heat stability test 5.2.*
4. *Unless another temperature is specified.*
5. *These tests need be carried out only in case of doubt as to the result of the 2-hour emulsion stability test.*
6. *The test should be carried out at the application concentration.*
7. *Attention is drawn to the appropriate national and international regulations concerning the handling and transport of flammable materials.*
8. *Unless other temperatures and/or times are specified.*
9. *The sample is not centrifuged as described in MT 39. Instead the sieve test (4.4) is carried out.*
10. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

BROMOXYNIL

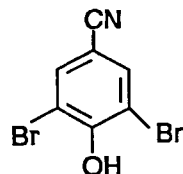
3,5-dibromo-4-hydroxybenzonitrile



INFORMATION

COMMON NAME: bromoxynil (ISO)

STRUCTURAL FORMULA:



EMPIRICAL FORMULA: C₇ H₃ Br₂ N O

RMM: 276.9

CAS REGISTRY NUMBER: 1689-84-5

CIPAC CODE NUMBER: 87

CHEMICAL NAMES: 3,5-dibromo-4-hydroxybenzonitrile (IUPAC and CA)
3,5-dibromo-4-hydroxyphenyl cyanide (IUPAC)

BROMOXYNIL TECHNICAL

FAO Specification 87/TC/S/F (1995)

1. DESCRIPTION

The material shall consist of bromoxynil together with related manufacturing impurities and shall be a cream to brownish or pinkish cream powder or granules, free from visible extraneous matter and added modifying agents (Note 1).

2. ACTIVE INGREDIENT

2.1 Identity tests (Note 2)

If the identity of the active ingredient is in doubt, then the dried material shall comply with at least one of the following tests.

2.1.1 Melting point (87/TC/M/2.1, CIPAC 1C, p.1989)

Minimum: 188°C.

2.1.2 IR spectrum (87/TC/M/2.2, CIPAC 1C, p.1989)

The spectrum produced from the sample shall be consistent with that produced from a bromoxynil standard.

2.2 Bromoxynil (87/TC/M/3, CIPAC 1C, p.1990. Note 2)

The bromoxynil content shall be declared (not less than 970 g/kg on the dried material) and, when determined, the content obtained shall not differ from that declared by more than ±20 g/kg.

3. IMPURITIES

3.1 Water

3.1.1 Dry material (MT 30.1, CIPAC F, p.91)

Maximum: 15 g/kg.

3.1.2 Wet material (MT 30.2, CIPAC F, p.93)

The water content shall be declared (maximum : 100 g/kg).

3.2 Sulfated ash (MT 29, CIPAC F, p.91. Note 2)

Maximum: 5 g/kg.

NOTES

1. *Some technical material may be produced as wet material containing up to 100 g/kg of water.*
2. *In the case of wet material, the determinations shall be carried out on the dried material.*

BROMOXYNIL HEPTANOATE

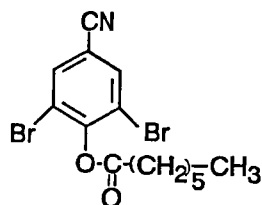
2,6-dibromo-4-cyanophenyl heptanoate

TENTATIVE SPECIFICATION

INFORMATION

COMMON NAME: bromoxynil heptanoate

STRUCTURAL FORMULA:



EMPIRICAL FORMULA: $C_{14}H_{15}Br_2NO_2$

RMM: 389.1

CAS REGISTRY NUMBER: 56634-95-8

CIPAC CODE NUMBER: 87.3 hep

CHEMICAL NAME: 2,6-dibromo-4-cyanophenyl heptanoate (IUPAC and CA)

BROMOXYNIL HEPTANOATE TECHNICAL

FAO Specification 87.3 hep/TC/S/T (1995)

1. DESCRIPTION

The material shall consist of bromoxynil heptanoate together with related manufacturing impurities and shall be a pale brown or brown crystalline mass with a characteristic odour, free from visible extraneous matter and added modifying agents. It shall be manufactured from bromoxynil technical complying with FAO specification 87/TC/S/F (1995).

2. ACTIVE INGREDIENT

2.1 Identity tests¹

If the identity of the active ingredient is in doubt, then it shall comply with at least one of the following tests.

2.1.1 Chromatographic retention time

The relative retention time of the sample shall be consistent with that of a bromoxynil heptanoate standard.

2.1.2 IR Spectrum

The spectrum produced from the sample shall be consistent with that produced from a bromoxynil heptanoate standard.

2.2 Bromoxynil heptanoate¹

The bromoxynil heptanoate content shall be declared (not less than 930 g/kg, equivalent to 662 g/kg bromoxynil) and, when determined, the content obtained shall not differ from that declared by more than ± 20 g/kg.

¹Methods available from Pesticides Information Officer, FAO Plant Protection Division

BROMOXYNIL HEPTANOATE EMULSIFIABLE CONCENTRATES

FAO Specification 87.3 hep/EC/S/T (1995)

1. DESCRIPTION

The material shall consist of technical bromoxynil heptanoate, complying with the requirements of FAO specification 87.3 hep/TC/S/T (1995), dissolved in suitable solvents together 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 tests¹**

If the identity of the active ingredient is in doubt, then the isolated active ingredient shall comply with at least one of the following tests.

2.1.1 Chromatographic retention time

The relative retention time of the sample shall be consistent with that of a bromoxynil heptanoate standard.

2.1.2 IR Spectrum

The spectrum produced from the sample shall be consistent with that produced from a bromoxynil heptanoate standard.

2.2 Bromoxynil¹

The bromoxynil equivalent content shall be declared (g/l 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 250 g/l	± 6% of the declared content
Above 250 up to 500 g/l	± 5% of the declared content
Above 500 g/l	± 25 g/l

¹ Methods available from the Pesticides Information Officer, FAO Plant Protection Division. (Not yet published by CIPAC).

3. IMPURITIES

3.1 Water (MT 30.1, CIPAC F, p.91)

Maximum: 2 g/l.

4. PHYSICAL PROPERTIES

4.1 Acidity (MT.31.2, CIPAC F, p.98)

Maximum: 0.2 ml of 1N sulfuric acid per gram of declared bromoxynil content.

4.2 Emulsion stability and re-emulsification (MT 36.1.1, CIPAC F, p.108)

The product, when diluted at 30°C with CIPAC Standard Waters A and D, shall comply with the following:

<u>Time after dilution</u>	<u>Limits of stability</u>
0 h	Initial emulsification complete
0.5 h	"cream", maximum: 2ml
2.0 h	"cream", maximum: 4 ml
	"free oil", maximum: 0.2 ml
24 h (Note 1)	Re-emulsification complete
24.5 h (Note 1)	"cream" maximum: 4 ml
	"Free oil", maximum: 0.2ml

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

5. STORAGE STABILITY

5.1 Stability at 0°C (MT 39.1, CIPAC F, p.128)

After storage at $0 \pm 1^\circ\text{C}$ 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 F, p.150)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days, the determined average active ingredient content must not be lower than 95% relative to the determined average content found before storage (Note 2) and the product shall continue to comply with 4.1 and 4.2.

NOTES

1. *These tests need be carried out only in case of doubt as to the result of the 2-hour emulsion stability test.*
2. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

BROMOXYNIL OCTANOATE

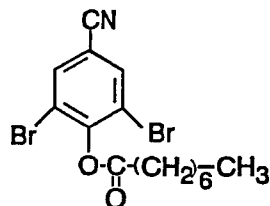
2,6-dibromo-4-cyanophenyl octanoate



INFORMATION

COMMON NAME: bromoxynil octanoate

STRUCTURAL FORMULA:



EMPIRICAL FORMULA: $C_{15}H_{17}Br_2NO_2$

RMM: 403.0

CAS REGISTRY NUMBER: 1689-99-2

CIPAC CODE NUMBER: 87.3 oct

CHEMICAL NAME: 2,6-dibromo-4-cyanophenyl octanoate (IUPAC and CA)

BROMOXYNIL OCTANOATE TECHNICAL

FAO Specification 87.3 oct/TC/S/F (1995)

1. DESCRIPTION

The material shall consist of bromoxynil octanoate together with related manufacturing impurities and shall be a pale brown to brown crystalline powder or crystalline mass with a characteristic odour free from visible extraneous matter and added modifying agents. It shall be manufactured from bromoxynil technical complying with FAO specification 87/TC/S/F (1995).

2. ACTIVE INGREDIENT

2.1 Identity tests

If the identity of the active ingredient is in doubt, then it shall comply with at least one of the following tests.

2.1.1 Chromatographic retention time (87.3 oct/TC/M/3.1 or 3.2, CIPAC 1C, p.2000)

The relative retention time of the sample shall be consistent with that of a bromoxynil octanoate standard.

2.1.2 IR Spectrum (87.3 oct/TC/M/2.2, CIPAC 1C, p.1998)

The spectrum produced from the sample shall be consistent with that produced from a bromoxynil octanoate standard.

2.2 Bromoxynil octanoate (87.3 oct /TC/M/3.1 or 3.2, CIPAC 1C, p.2000)

The bromoxynil octanoate content shall be declared (not less than 920 g/kg, equivalent to 632 g/kg bromoxynil) and, when determined, the content obtained shall not differ from that declared by more than ± 20 g/kg.

3. IMPURITIES

3.1 Free acidity (87.3-oct/TC/M.4, CIPAC 1C, p.2005)

Maximum: 10 ml of 1N sulfuric acid per cent
(Equivalent to 27.7 g/kg expressed as Bromoxynil, RMM = 276.9)

3.2 Water (MT 30.1, CIPAC F, p.91)

Maximum: 1 g/kg.

3.3 Sulfated ash (MT 29, CIPAC F, p. 91)

Maximum: 5 g/kg.

3.4 Material insoluble in xylene (MT 11, CIPAC F, p.30)

Maximum: 1 g/kg.

BROMOXYNIL OCTANOATE EMULSIFIABLE CONCENTRATES

FAO Specification 87.3 oct/EC/S/F (1995)

1. DESCRIPTION

The material shall consist of technical bromoxynil octanoate, complying with the requirements of FAO specification 87.3 oct/TC/S/F (1995), dissolved in suitable solvents together 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**

If the identity of the active ingredient is in doubt, then the isolated active ingredient shall comply with at least one of the following tests:

2.1.1 Chromatographic retention time (87.3 oct/TC/M/3.1 or 3.2, CIPAC 1C, p.2000)

The relative retention time of the sample shall be consistent with that of a bromoxynil octanoate standard.

2.1.2 IR Spectrum (87.3 oct/EC/M/2.2, CIPAC 1C, p.1998)

The spectrum produced from the sample shall be consistent with that produced from a bromoxynil octanoate standard.

2.2 Bromoxynil (87.3 oct/EC/M/ 3.1 or 3.2, CIPAC 1C, pp.2000-2005)

The bromoxynil equivalent content shall be declared (g/l 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 250 g/l	± 6% of the declared content
Above 250 up to 500 g/l	± 5% of the declared content
Above 500 g/l	± 25 g/l

40

3. IMPURITIES**3.1 Water** (MT 30.1, CIPAC F, p.91)

Maximum: 2 g/l.

4. PHYSICAL PROPERTIES**4.1 Acidity** (MT 31.2, CIPAC F, p.98)

Maximum: 0.2 ml of 1N sulfuric acid per gram of declared bromoxynil content.

4.2 Emulsion stability and re-emulsification (MT 36.1.1, CIPAC F, p.108)

The product, when diluted at 30°C with CIPAC Standard Waters A and D, shall comply with the following:

<u>Time after dilution</u>	<u>Limits of stability</u>
0 h	Initial emulsification complete
0.5 h	"cream", maximum: 2ml
2.0 h	"cream", maximum: 4 ml
	"free oil", maximum: 0.2 ml
24 h (Note 1)	Re-emulsification complete
24.5 h (Note 1)	"cream" maximum: 4 ml
	"Free oil", maximum: 0.2ml

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

5. STORAGE STABILITY**5.1 Stability at 0°C** (MT 39.1, CIPAC F, p.128)

After storage at $0 \pm 1^\circ\text{C}$ 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 F, p. 150)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days, the determined average active ingredient content must not be lower than 95% relative to the determined average content found before storage (Note 2) and the product shall continue to comply with 4.1 and 4.2.

NOTES

1. *These tests need be carried out only in case of doubt as to the result of the 2-hour emulsion stability test.*
2. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

DIQUAT DIBROMIDE

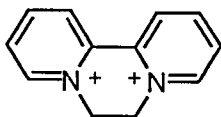
9,10-dihydro-8a,10a-diazoniaphenanthrene dibromide



INFORMATION

COMMON NAME: diquat is the ISO name for the cation

STRUCTURAL FORMULA (CATION):



EMPIRICAL FORMULA: $C_{12}H_{12}N_2$ (cation)

RMM: 184.2 (cation)

CAS REGISTRY NUMBERS: 2764-72-9 (cation)
85-00-7 (dibromide)
6385-62-2 (dibromide monohydrate)

CIPAC CODE NUMBER: 55

CHEMICAL NAMES: 9,10-dihydro-8a,10a-diazoniaphenanthrene dibromide (IUPAC)
6,7-dihydrodipyrido-[1,2-a:2'1'-c]pyrazine-5,8-di-ium dibromide (IUPAC)
1,1'-ethylene-2,2'-bipyridyldiylium dibromide (IUPAC)
6,7-dihydrodipyrido[1,2-a:2'1'-c]pyrazinediium dibromide (CA)

DIQUAT DIBROMIDE TECHNICAL CONCENTRATES

FAO Specification 55/TK/S/F (1994)

1. DESCRIPTION

The material shall consist essentially of an aqueous solution of technical diquat dibromide together with related manufacturing impurities, and may contain small amounts of suspended matter, immiscible solvents and sediment, as specified.

2. ACTIVE INGREDIENT

2.1 Identity tests (55/SL/M/2, CIPAC G, p.47)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Diquat dibromide (55/SL/M/3, CIPAC E, p.74)

The diquat dibromide content (Note 1) shall be declared (not less than 467 g/l at 20°C, Note 2) and, when determined, the content obtained shall not differ from that declared by more than ± 25 g/kg.

3. IMPURITIES

3.1 Ethylene dibromide¹

Maximum: 10 mg/kg.

3.2 Free 2,2'-bipyridyl (Method 55/13/M/7.4, CIPAC 1A, p.1245)

Maximum: 0.2% by weight of the diquat dibromide content found under 2.2.

4. PHYSICAL PROPERTIES

4.1 pH range (MT 75.1, CIPAC F, p.205)

pH range: 3.5 to 7.5.

¹Method available from the Pesticide Information Officer, FAO Plant Production and Protection Division.

5. CONTAINERS

Containers may be manufactured from suitable polymeric materials or metal, and must comply with pertinent national and international transport and safety regulations. Where metal is used containers shall be lined with suitable polymeric material, or the internal surfaces treated to prevent corrosion of the container and/or deterioration of the contents. The product must not be allowed to come into direct contact with metal.

NOTES

1. *Multiply the diquat ion content as determined by CIPAC method 55/SL/M/3 by 1.87.*
2. *If the buyer requires both g/l at 20°C and g/kg, then in case of dispute the analytical results shall be calculated as g/kg.*

DIQUAT DIBROMIDE AQUEOUS SOLUTIONS

FAO Specification 55/SL/S/F (1994)

1. DESCRIPTION

The material shall consist essentially of an aqueous solution of technical diquat dibromide together with formulation adjuvants, and may include appropriate wetting agents. The technical diquat dibromide shall comply with the requirements of FAO Specification 55/TK/S/F (1994).

2. ACTIVE INGREDIENT

2.1 Identity tests (55/SL/M/2, CIPAC G, p.47)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Diquat dibromide (55/SL/M/3, CIPAC E, p.74)

The diquat dibromide content (Note 1) shall be declared (g/kg and/or g/l at 20°C, Note 2) and, when determined, the content obtained shall not differ from that declared by more than the following amounts.

<u>Declared content</u>	<u>Permitted tolerances</u>
25 up to 100 g/kg or g/l	± 10% of the declared content
Above 100 up to 250 g/kg or g/l	± 6% of the declared content
Above 250 up to 500 g/kg or g/l	± 5% of the declared content

3. PHYSICAL PROPERTIES

3.1 Stability on dilution (MT 41, CIPAC F, p.131)

The product, after dilution with CIPAC Standard Water C, shall give a clear and homogeneous solution after standing for 18 hours at 20°C (Note 3).

3.2 pH range (MT 75.1, CIPAC F, p.205)

pH range: 4.0 to 8.0.

4. STORAGE STABILITY

4.1 Stability at 0°C (MT 39.2, CIPAC F, p.129)

After storage at $0 \pm 1^\circ\text{C}$ for 48 hours, there shall not be more than a trace of separated material.

4.2 Stability at 54°C (MT 46.1.3, CIPAC F, p.150)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days the determined average active ingredient content must not be lower than 97% relative to the determined average content found before storage (Note 4) and the product shall continue to comply with 3.1 and 3.2.

5. CONTAINERS

Containers may be manufactured from suitable polymeric materials or metal, and must comply with pertinent national and international transport and safety regulations. Where metal is used containers shall be lined with suitable polymeric material, or the internal surfaces treated to prevent corrosion of the container and/or deterioration of the contents. The product must not be allowed to come into direct contact with metal.

NOTES

1. *Multiply the diquat ion content as determined by CIPAC 55/SL/M/3 by 1.87.*
2. *If the buyer requires both g/l at 20°C and g/kg, then in case of dispute the analytical results shall be calculated as g/kg.*
3. *Some formulations containing added wetter may show signs of layering and produce an oily precipitate under the conditions of test in MT41. This is acceptable, and does not affect biological efficacy on or spray characteristics at normal spray dilution.*
4. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

DIQUAT DIBROMIDE - PARAQUAT DICHLORIDE AQUEOUS SOLUTIONS

FAO Specifications 55 and 56/SL/S/F (1994)

1. DESCRIPTION

The material shall consist essentially of an aqueous solution of technical diquat dibromide and paraquat dichloride, together with added wetting and safening agents which will include an effective emetic and blue/green colourant and may include stenching agents and thickeners. It shall contain not more than a trace of suspended matter, immiscible solvents and sediment. The technical paraquat dichloride shall comply with the requirements of FAO Specification 56/TK/S/F (1994) and the technical diquat dibromide with 55/TK/S/F (1994).

2. ACTIVE INGREDIENT

2.1 Identity tests (55 + 56/SL/M/2, CIPAC G, p.47)

Identity tests are required if the identities of the active ingredients are in doubt.

2.2 Diquat dibromide (55 + 56/SL/M/3, CIPAC E, p.75)

The diquat dibromide content (Note 1) shall be declared (g/kg and/or g/l at 20°C , Note 2) 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>
25 up to 100 g/kg or g/l	$\pm 10\%$ of the declared content
Above 100 up to 250 g/kg or g/l	$\pm 6\%$ of the declared content
Above 250 up to 500 g/kg or g/l	$\pm 5\%$ of the declared content

2.3 Paraquat dichloride (55 + 56/SL/M/4, CIPAC E, p.76)

The paraquat dichloride content (Note 3) shall be declared (g/kg and/or g/l at 20°C , Note 2), 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>
25 up to 100 g/kg or g/l	$\pm 10\%$ of the declared content
Above 100 up to 250 g/kg or g/l	$\pm 6\%$ of the declared content
Above 250 up to 500 g/kg or g/l	$\pm 5\%$ of the declared content

2.4 Emetic content

An effective emetic must be included at a specified level. The content shall be declared and, when determined, shall not differ from that declared by more than $\pm 15\%$ (Note 4).

3. **PHYSICAL PROPERTIES**3.1 Stability on dilution (MT 41, CIPAC F, p.131)

The product, after dilution with CIPAC Standard Water C, shall give a clear and homogeneous solution after standing for 18 hours at 20°C (Note 5).

3.2 pH range (MT 75.1, CIPAC F, p.205)

pH range: 4.0 to 8.0.

4. **STORAGE STABILITY**4.1 Stability at 0°C (MT 39.2, CIPAC F, p.129)

After storage at $0 \pm 1^\circ\text{C}$ for 48 hours, there shall not be more than a trace of separated material.

4.2 Stability at 54°C (MT 46.1.3, CIPAC F, p.149)

After storage at $54^\circ\text{C} \pm 2^\circ\text{C}$ for 14 days, the determined average active ingredient contents must not be lower than 97% relative to the determined average contents found before storage (Note 6) and the product shall continue to comply with 3.1 and 3.2.

5. **CONTAINERS**

Containers may be manufactured from suitable polymeric materials or metal, and must comply with pertinent national and international transport and safety regulations. Where metal is used containers shall be lined with suitable polymeric material, or the internal surfaces treated to prevent corrosion of the container and/or deterioration of the contents. The product must not be allowed to come into direct contact with metal.

NOTES

1. *Multiply the diquat ion content as determined by CIPAC 55 + 56/SL/M/3 by 1.87.*
2. *If the buyer requires both g/l at 20°C and g/kg, then in case of dispute the analytical results shall be calculated as g/kg.*
3. *Multiply the paraquat ion content as determined by CIPAC method 55 + 56/SL/M/4 by 1.38.*
4. *To be effective the emetic must meet the following criteria:*
 - *It must be rapidly absorbed (more rapidly than paraquat) and be quick acting. Emesis must occur in about half an hour in at least 50% of cases.*
 - *It must be an effective (strong) stimulant of the emetic centre to produce effective emesis. The emetic effect should have a limited 'action period' of about two to three hours to allow effective treatment of poisoning.*
 - *It must act centrally on the emetic centre in the brain.*
 - *It must not be a gastric irritant because, as paraquat itself is an irritant, this could potentiate the toxicity of paraquat.*
 - *It must be toxicologically acceptable. It must have a short half-life in the body (to comply with the need for a limited action period).*
 - *It must be compatible with and stable in the paraquat formulation and not affect the herbicidal efficiency or occupational use of the product.*
6. *Some formulations containing additional water may show signs of layering and produce an oily precipitate under the conditions of test in MT41. This is acceptable, and does not affect biological efficacy or spray characteristics at normal spray dilution.*
7. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

IOXYNIL

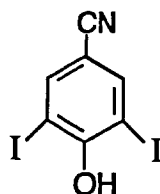
4-hydroxy-3,5-di-iodobenzonitrile



INFORMATION

COMMON NAME: ioxynil (ISO)

STRUCTURAL FORMULA:

EMPIRICAL FORMULA: $C_7H_3I_2NO$

RMM: 370.9

CAS NUMBER: 1689-83-4

CIPAC CODE NUMBER: 86

CHEMICALS NAMES: 4-hydroxy-3,5-di-iodobenzonitrile (IUPAC)
 4-hydroxy-3,5-di-iodophenyl cyanide (IUPAC)
 4-hydroxy-3,5-diiodobenzonitrile (CA)

IOXYNIL TECHNICAL

FAO Specification 86 /TC/S/F (1995)

1. DESCRIPTION

The material shall consist of ioxynil together with related manufacturing impurities. It shall be a cream to brownish cream coloured powder, free from visible extraneous matter and added modifying agents (Note 1).

2. ACTIVE INGREDIENT

2.1 Identity tests (Note 2)

If the identity of the active ingredient is in doubt, then it shall comply with at least one of the following tests.

2.1.1 HPLC (86/TC/M/2.1, CIPAC E, p.101)

The relative retention time of the dried material shall be consistent with that of an ioxynil standard.

2.1.2 IR Spectrum (86/TC/M/2.2, CIPAC E, p.102)

The spectrum produced from the dried material shall be consistent with that produced from an ioxynil standard.

2.2 Ioxynil (86/TC/M/3, CIPAC E, p.102. Note 2)

The ioxynil content shall be declared (not less than 960 g/kg on the dried material) and, when determined, the content obtained shall not differ from that declared by more than ± 20 g/kg.

3. IMPURITIES

3.1 Water3.1.1 Dry material (MT 30.1, CIPAC F, p.91)

Maximum: 15 g/kg.

3.1.2 Wet material (MT 30.2, CIPAC F, p.93)

The water content shall be declared (maximum: 100 g/kg).

3.2 Sulfated ash (MT 29, CIPAC F, p.91. Note 2)

Maximum: 5 g/kg.

NOTES

1. *Some technical material may be produced as wet material containing up to 100 g/kg of water.*
2. *In the case of wet material, the determinations shall be carried out on the dried material.*

IOXYNIL OCTANOATE

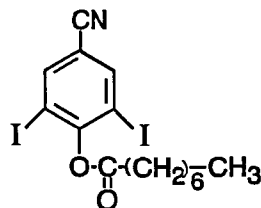
4-cyano-2,6-di-iodophenyl octanoate



INFORMATION

COMMON NAME: ioxynil octanoate (ISO)

STRUCTURAL FORMULA:



EMPIRICAL FORMULA: $C_{15}H_{17}I_2NO_2$

RMM: 497.1

CAS REGISTRY NUMBER: 3861-47-0

CIPAC CODE NUMBER: 86.3 oct

CHEMICAL NAMES: 4-cyano-2,6-di-iodophenyl octanoate (IUPAC)
4-cyano-2,6-diiodophenyl octanoate (CA)

IOXYNIL OCTANOATE TECHNICAL

FAO Specification 86.3 oct /TC/S/F (1995)

1. DESCRIPTION

The product shall consist of ioxynil octanoate together with related manufacturing impurities and shall be a pale brown or brown crystalline material with a characteristic odour, free from visible extraneous matter and added modifying agents. It shall be manufactured from ioxynil technical complying with FAO specification 86/TC/S/F (1995).

2. ACTIVE INGREDIENT

2.1 Identity tests

If the identity of the active ingredient is in doubt, then it shall comply with at least one of the following tests.

2.1.1 GLC (86.3/TC/M/2.1, CIPAC G, p.95)

The relative retention time of the sample shall be consistent with that of an ioxynil octanoate standard.

2.1.2 IR Spectrum (CIPAC 1A, p.1472)

The spectrum produced from the sample shall be consistent with that produced from an ioxynil octanoate standard.

2.2 Ioxynil octanoate (86.3/TC/M/3, CIPAC G, p.95)

The ioxynil octanoate content shall be declared (not less than 920 g/kg equivalent to 686 g/kg ioxynil) and, when determined, the content obtained shall not differ from that declared by more than ± 20 g/kg.

3. IMPURITIES

3.1 Free acidity (MT 31.2, CIPAC F, p.98)

Maximum: 10 ml of 1N sulfuric acid per cent.
(Equivalent to 37.1 g/kg expressed as ioxynil, RMM = 370.9)

3.2 Water (MT 30.1, CIPAC F, p.91)

Maximum: 1 g/kg.

3.3 Sulfated ash (MT 29, CIPAC F, p.91)

Maximum: 5 g/kg.

3.4 Material insoluble in xylene (MT 11, CIPAC F, p.30)

Maximum: 1 g/kg.

IOXNYL OCTANOATE EMULSIFIABLE CONCENTRATES

FAO Specification 86.3 oct/EC/S/F (1995)

1. DESCRIPTION

The material shall consist of technical ioxnyl octanoate, complying with the requirements of FAO specification 86.3 oct/TC/S/F (1995), dissolved in suitable solvents together 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**

If the identity of the active ingredient is in doubt, then the isolated active ingredient shall comply with at least one of the following tests.

2.1.1 GLC (86.3/EC/M/2.1, CIPAC G, p.97)

The relative retention time of the sample shall be consistent with that of an ioxnyl octanoate standard.

2.1.2 IR Spectrum (CIPAC 1A, p.1472)

The spectrum produced from the sample shall be consistent with that produced from an ioxnyl octanoate standard.

2.2 Ioxnyl octanoate (86.3/EC/M/3, CIPAC G, p.97)

The ioxnyl equivalent content shall be declared (g/l 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 250 g/l	± 6% of the declared content
Above 250 up to 500 g/l	± 5% of the declared content
Above 500 g/l	± 25 g/l

3. IMPURITIES

3.1 Water (MT 30.1, CIPAC F, p.91)

Maximum: 2 g/l.

4. PHYSICAL PROPERTIES

4.1 Acidity (MT 31.2, CIPAC F, p.98)

Maximum: 0.2 ml of 1N sulfuric acid per gram of declared ioxynil content.

4.2 Emulsion stability and re-emulsification (CIPAC F, MT 36.1.1, p.108)

The product, when diluted at 30°C with CIPAC Standard Waters A and D, shall comply with the following:

<u>Time after dilution</u>	<u>Limits of stability</u>
0 h	Initial emulsification complete
0.5 h	"cream", maximum: 2 ml
2.0 h	"cream", maximum: 4 ml
	"free oil", maximum: 0.2 ml
24 h (Note 1)	Re-emulsification complete
24.5 h (Note 1)	"cream" maximum: 4 ml
	"Free oil", maximum: 0.2 ml

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

5. STORAGE STABILITY

5.1 Stability at 0°C (CIPAC F, MT 39.1, p.128)

After storage at $0 \pm 1^\circ\text{C}$ 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 (CIPAC F, MT 46.1.3, p.148)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days, the determined average active ingredient content must not be lower than 95% relative to the determined average content found before storage (Note 2) and the product shall continue to comply with 4.1 and 4.2.

NOTES

1. *These tests need be carried out only in case of doubt as to the result of the 2-hour emulsion stability test.*
2. *Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.*

PARAQUAT DICHLORIDE

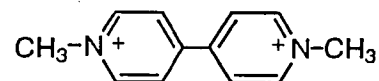
1,1'-dimethyl-4,4'-bipyridinium dichloride



INFORMATION

COMMON NAME: paraquat it the ISO name for the cation

STRUCTURAL FORMULA (CATION):



EMPIRICAL FORMULA: $C_{12}H_{14}N_2$ (cation)

RMM: 186.3 (cation)

CAS REGISTRY NUMBERS: 4685-14-7 (cation)
1910-42-5 (dichloride)

CIPAC CODE NUMBER: 56

CHEMICAL NAME: 1,1'-dimethyl-4,4'-bipyridinium dichloride (IUPAC and CA)

PARAQUAT DICHLORIDE TECHNICAL CONCENTRATES

FAO Specification 56/TK/S/F (1994)

1. DESCRIPTION

The material shall consist essentially of an aqueous solution of paraquat dichloride, together with related manufacturing impurities containing not more than a trace of suspended matter, immiscible solvents or sediment, and containing an effective emetic. Technical concentrates may also include colourants.

2. ACTIVE INGREDIENT

2.1 Identity tests (56/SL/M/2, CIPAC G, p.128)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Paraquat dichloride (56/SL/M/3, CIPAC E, p.167)

The paraquat dichloride content (Note 1) shall be declared (not less than 500 g/l at 20°C, Note 2) and, when determined, the content obtained shall not differ from that declared by more than ± 25 g/kg.

2.3 Emetic content

An effective emetic must be included at a specified level. The content shall be declared and, when determined, shall not differ from that declared by more than $\pm 15\%$ (Note 3).

3. IMPURITIES

3.1 Free 4,4'-bipyridyl (56/13/M/7.4, CIPAC 1A, p.1317)

Maximum: 0.2% by weight of the paraquat dichloride content found under 2.2.

4. PHYSICAL PROPERTIES

4.1 pH range (56/13/M/7.5, CIPAC 1A, p. 1589)

pH range: 2.0 to 6.0.

5. CONTAINERS

Containers may be manufactured from suitable polymeric materials or metal, and must comply with pertinent national and international transport and safety regulations. If metal is used containers shall be lined with suitable polymeric material, or the internal surfaces treated to prevent corrosion of the container and/or deterioration of the contents. The product must not be allowed to come into direct contact with metal.

Notes

1. *Multiply the paraquat ion content as determined by CIPAC method 56/SL/M/3 by 1.38*
2. *If the buyer requires both g/l at 20°C and g/kg, then in case of dispute the analytical results shall be calculated as g/kg.*
3. *To be effective the emetic must meet the following criteria:*
 - *It must be rapidly absorbed (more rapidly than paraquat) and be quick acting. Emesis must occur in about half an hour in at least 50% of cases.*
 - *It must be an effective (strong) stimulant of the emetic centre to produce effective emesis. The emetic effect should have a limited 'action period' of about two to three hours to allow effective treatment of poisoning.*
 - *It must act centrally on the emetic centre in the brain.*
 - *It must not be a gastric irritant because, as paraquat itself is an irritant, this could potentiate the toxicity of paraquat.*
 - *It must be toxicologically acceptable. It must have a short half-life in the body (to comply with the need for a limited action period).*
 - *It must be compatible with and stable in the paraquat formulation and not affect the herbicidal efficiency or occupational use of the product.*

PARAQUAT DICHLORIDE AQUEOUS SOLUTIONS

FAO Specification 56/SL/S/F (1994)

1. DESCRIPTION

The material shall consist essentially of an aqueous solution of technical paraquat dichloride, together with wetting and safening agents which will include an effective emetic and blue/green colourants, and may include other safeners including stenching agents and thickeners. It shall contain not more than a trace of suspended matter, immiscible solvents and sediment. The technical paraquat dichloride shall comply with the requirements of FAO specification 56/TK/S/F (1994).

2. ACTIVE INGREDIENT

2.1 Identity tests (56/SL/M/2, CIPAC G, p.128)

An identity test is required if the identity of the active ingredient is in doubt.

2.2 Paraquat dichloride (56/SL/M/3, CIPAC E, p.167)

The paraquat dichloride content (Note 1) shall be declared (g/kg and/or g/l at 20°C, Note 2) 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>
25 up to 100 g/kg or g/l	± 10% of the declared content
Above 100 up to 250 g/kg or g/l	± 6% of the declared content
Above 250 up to 500 g/kg or g/l	± 5% of the declared content

2.3 Emetic content

An effective emetic must be included at a specified level. The content shall be declared and, when determined, shall not differ from that declared by more than ± 15% (Note 3).

3. PHYSICAL PROPERTIES

3.1 Stability on dilution (MT 41, CIPAC F, p.131)

The product, after dilution with CIPAC Standard Water C, shall give a clear and homogeneous solution after standing for 18 hours at 20°C (Note 4).

3.2 pH range (MT 75.1, CIPAC F, p.205)

pH range: 6.0 to 8.0.

4. **STORAGE STABILITY**4.1 Stability at 0°C (MT39.2, CIPAC F, p.129)

After storage at $0 \pm 1^\circ\text{C}$ for 48 hours, there shall not be more than a trace of separated material.

4.2 Stability at 54°C (MT 46.1.3, CIPAC F, p.149)

After storage at $54 \pm 2^\circ\text{C}$ for 14 days, the determined average active ingredient content must not be lower than 97% relative to the determined average content found before storage (Note 5), and the product shall continue to comply with 3.1 and 3.2.

5. **CONTAINERS**

Containers may be manufactured from suitable polymeric materials or metal, and must comply with pertinent national and international transport and safety requirements. Where metal is used containers shall be lined with suitable polymeric material, or the internal surfaces treated to prevent corrosion of the container and/or deterioration of the contents. The product must not be allowed to come into direct contact with metal.

NOTES

1. Multiply the paraquat ion content as determined by CIPAC method 56/SL/M/3 by 1.38.
2. If the buyer requires both g/l at 20°C and g/kg, then in case of dispute the analytical results shall be calculated as g/kg.
3. To be effective the emetic must meet the following criteria:
 - It must be rapidly absorbed (more rapidly than paraquat) and be quick acting. Emesis must occur in about half an hour in at least 50% of cases.
 - It must be an effective (strong) stimulant of the emetic centre to produce effective emesis. The emetic effect should have a limited 'action period' of about two to three hours to allow effective treatment of poisoning.
 - It must act centrally on the emetic centre in the brain.
 - It must not be a gastric irritant because, as paraquat itself is an irritant, this could potentiate the toxicity of paraquat.

- It must be toxicologically acceptable. It must have a short half-life in the body (to comply with the need for a limited action period).
- It must be compatible with and stable in the paraquat formulation and not affect the herbicidal efficiency or occupational use of the product.

4. Some formulations containing additional wetter may show signs of layering and produce an oily precipitate under the conditions of test in MT41. This is acceptable, and does not affect biological efficacy or spray characteristics at normal spray dilution.
5. Samples of the product taken before and after the storage stability test should be analysed together after the test to reduce the analytical error.

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