



Food and Agriculture Organization  
of the United Nations

AGP: CP/100

FAO SPECIFICATIONS  
FOR PLANT PROTECTION PRODUCTS

**2,4-DB**

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

## CONTENTS

DISCLAIMER	1
INTRODUCTION	2
INFORMATION	5

### FAO Specification Status 1983

#### 2,4-DB

Technical	Provisional	6
Potassium salt technical	Provisional	9
Technical esters	Tentative	12
Salt aqueous solutions	Provisional	15

## DISCLAIMER

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

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

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

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

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

## INTRODUCTION

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

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

FAO now publishes three classes of specifications:

A) FAO Specifications (Code "S"): specifications that are acceptable on the basis of the evidence presented 2/, 3/.

---

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), and CIPAC Proceedings 1980 and 1981, obtainable from Heffers Printers 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). Heffers Printers Limited, King's Hedges Road, Cambridge. CB4 2PQ, England.

---

- B) FAO Provisional Specifications (Code "(S)"): specifications which are usable but may require some further work (e.g., final clarifications of certain methods of analysis).
- C) FAO Tentative Specifications (Code "ts"): specifications that the Group on Specifications believe may prove useful but for which critical data (e.g., collaboratively studied methods of analysis) may not yet be available.

The clauses of the specifications are divided into "requirements" and "information", the latter being indicated in the individual specifications by an asterisk. 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 grammes/kilogram (g/kg) expression of content. For all other liquids the active ingredient content of the product shall be declared in terms of grammes per litre (g/l) at 20° C. The content may also be requested in terms of g/kg and density.

In the cases of dispute, however, where a user of the specifications has information on the content both in terms of g/l and g/kg, the g/kg 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, but mainly to compensate for possible inaccuracies in relevant methods of analysis. For examples

of such permitted tolerances, see document mentioned in footnote 4/.

---

4/ 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 Plant Production and Protection Paper 13, "The Use of FAO Specifications for Plant Protection Products", FAO, Rome, 1979 (Available in English, French or Spanish).

---

**INFORMATION**

COMMON NAME: 2,4-DB  
CIPAC CODE NO: 83  
EMPIRICAL FORMULA:  $C_{10}H_{10}Cl_2O_3$   
RMM: 249.1

## CHEMICAL NAMES:

2,4-DB is the ISO common name for 4-(2,4-dichlorophenoxy) butyric acid (IUPAC);  
4-(2,4-dichlorophenoxy)butanoic acid (CA; Registry No. 94-82-6).



**2,4-DB TECHNICAL**

FAO Provisional Specification October 1983  
(83/TC/(S)/- )

**.1 DESCRIPTION**

The material shall consist of grades of 2,4-DB together with related manufacturing impurities, which are white to brown crystals, granules, flakes or powder with not more than slight odour.

**.2 ACTIVE INGREDIENT****.2.1 Identity tests (CIPAC P81, p. 170)**

Where the identity of the material is in doubt the extractable acids shall comply with any two of the following tests:

**.2.1.1 Melting point (liquefaction point)**

114 to 119°C

The melting point shall not be depressed by admixture with an equal quantity of 2,4-DB.

**.2.1.2 IR**

The spectrum produced from the sample shall be consistent with that produced from a standard 2,4-DB.

**.2.1.3 GLC**

The major component in the sample chromatogram shall have the same retention time as that from a standard 2,4-DB chromatographed under identical conditions.

**.2.1.4 TLC**

The major component in the sample chromatogram shall have the same R<sub>f</sub> value as that from a standard 2,4-DB.

**.2.2 Extractable acids (CIPAC P81, p. 171)**

The total extractable acid content calculated on the anhydrous basis and expressed as 2,4-DB shall be not more than 1.14x where x is the content of 2,4-DB found under 2.3.

**.2.3 2,4-DB\***

The 2,4-DB content shall be declared (minimum declared 890 g/kg) calculated on the anhydrous basis and when determined the content obtained by more than +/- 30 g.

**.3 WATER** (MT 30.2, CIPAC 1, p. 899)**.3.1 Dry acids**

Maximum: 15 g/kg (Note 1)

**.3.2 Wet acids**

Material containing more than 15 g/kg of water is available (Note 2). The approximate water content shall be stated.

**.4 IMPURITIES****.4.1 Free phenols\***

Maximum: 20 g/kg (Note 3), expressed as 2,4-dichlorophenol (Note 4), of the 2,4-DB content found under .2.3 (Note 5).

**.4.2 Sulphated ash** (MT 29.1, CIPAC 1A, p. 1562; Note 6)

Maximum: 10 g/kg

**.4.3 Triethanolamine insolubles\***

A triethanolamine solution of the material shall leave not more than 1 g/kg of residue on a 105 µm test sieve and the sieved solution shall be clear or opalescent and shall contain not more than a trace of sediment.

**.5 CONTAINERS**

They should be suitable, clean, dry and as specified in the order and should adequately protect the material from external influences.

They should comply with pertinent national and international transport and safety regulations.

---

\* Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

NOTE 1 Use 50 g of sample.

NOTE 2 Difficulties of obtaining representative samples increase with increasing water content and may lead to erroneous results. The validity of the methods cited has been established only for materials containing up to 15 g/kg water.

NOTE 3 Interim limit which will be reviewed when collaborative work is complete on determination of free phenols.

NOTE 4 The content of free phenols is limited to avoid possible taint of neighbouring crops and foodstuffs.

NOTE 5 On a 900 g/kg 2,4-DB content the maximum permitted free phenol content would be 18 g/kg of the material.

NOTE 6 Use 10 g of sample.

**2,4-DB POTASSIUM SALT TECHNICAL**  
FAO Provisional Specification October 1983  
(83.1K/TC/(S)/-)

**.1 DESCRIPTION**

The material shall consist of 2,4-DB potassium salt, together with related manufacturing impurities, which is a white to brown crystalline powder with not more than slight odour.

**.2 ACTIVE INGREDIENT**

**.2.1 Identity tests\***

Where the identity of the material is in doubt the extractable acids shall comply with any two of the following tests:

**.2.1.1 Melting point** (liquefaction point)

114 to 119°C.

The melting point shall not be depressed by admixture with an equal quantity of 2,4-DB.

**.2.1.2 IR**

The spectrum produced from the sample shall be consistent with that produced from a standard 2,4-DB.

**.2.1.3 GLC**

The major component in the sample chromatogram shall have the same retention time as that from a standard 2,4-DB chromatographed under identical conditions.

**.2.1.4 TLC**

The major component in the sample chromatogram shall have the same R<sub>f</sub> value as that from a standard 2,4-DB.

**.2.2 Extractable acids\***

The total extractable acid content calculated on the anhydrous basis and expressed as 2,4-DB shall be not more than 1.14x where x is the content of 2,4-DB found under 2.3.

---

\* Method available from the Plant Protection Officer, FAO Plant Production and Protection Division.

**.2.3 2,4-DB\***

The 2,4-DB content shall be declared (minimum declared 760 g/kg) calculated on the anhydrous basis and when determined the content obtained shall not differ from that declared by more than +/- 30 g.

**.3 IMPURITIES****.3.1 Free phenols\***

Maximum: 15 g/kg (Note 1), expressed as 2,4-dichlorophenol (Note 2), of the 2,4-DB content found under .2.3 (Note 3).

**.3.2 Water** (MT 30.2, CIPAC 1, p. 899)

Maximum: 15 g/kg.

**.3.3 Water insolubles\***

An aqueous solution of the material shall pass completely through a 250 µm test sieve, not more than 1 g/kg shall remain on a 150 µm test sieve, and the sieved solution shall be clear or opalescent and shall contain not more than a trace of sediment.

**.4 PHYSICAL PROPERTIES****.4.1 Rate of solution\***

All the product, other than the insoluble material content found under .3.3, shall dissolve in 5 min in distilled water and the solution, after standing for 18 h, shall have not more than a trace of additional sediment.

**.5 CONTAINERS**

They should be suitable, clean, dry and as specified in the order and should adequately protect the material from external influences.

They should comply with pertinent national and international transport and safety regulations.

---

\* Method available from the Plant Protection Officer, FAO Plant Production and Protection Division.

NOTE 1 Interim limit which will be reviewed when collaborative work is complete on determination of free phenols.

NOTE 2 The content of free phenols is limited to avoid possible taint of neighbouring crops and foodstuffs.

NOTE 3 On a 770 g/kg 2,4-DB content the maximum permitted free phenol content would be 12 g/kg of the material.

**2,4-DB TECHNICAL ESTERS**  
FAO Tentative Specification October 1983  
(83.3/TC/ts/-)

**.1 DESCRIPTION**

The material shall consist of 2,4-DB technical ester(s), together with related manufacturing impurities. It shall be free from visible water and suspended matter.

**.2 ACTIVE INGREDIENT**

**.2.1 Esters**

The 2,4-DB ester(s) present shall be stated (Note 1), i.e., "R" shall be declared.

**.2.2 Identity tests\***

Where the identity of the material is in doubt the extractable acids shall comply with any two of the following tests:

**.2.2.1 Melting point** (liquefaction point)

114 to 119°C

The melting point shall not be depressed by admixture with an equal quantity of 2,4-DB.

**.2.2.2 IR**

The spectrum produced from the sample shall be consistent with that produced from a standard 2,4-DB.

---

\* Method available from the Plant Protection Officer, FAO Plant Production and Protection Service.

### **.2.2.3 GLC**

The major component in the sample chromatogram shall have the same retention time as that from a standard 2,4-DB chromatographed under identical conditions.

### **.2.2.4 TLC**

The major component in the sample chromatogram shall have the same R<sub>f</sub> value as that from a standard 2,4-DB.

### **.2.3 Extractable acids\***

The total extractable acid content expressed as 2,4-DB shall be not more than 1.14x where x is the content of 2,4-DB found under .2.4.

### **.2.4 2,4-DB\***

The nominal 2,4-DB content shall be declared (minimum declared: 740 g/kg of the theoretical extractable acid content) and when determined, the content obtained shall differ from that declared by not more than +/- 50 g.

## **.3 IMPURITIES**

### **.3.1 Free phenols\***

Maximum: 15 g/kg (Note 2) calculated as 2,4-dichlorophenol (Note 3), of the 2,4-DB content found under .2.4 (Note 4).

### **.3.2 Free acidity\***

Maximum: 30 g/kg expressed as 2,4-DB, of the extractable acid content found under .2.3.

### **.3.3 Suspended solids (MT 40.2, CIPAC 1, p. 932)**

Maximum: 1 g/kg.

### **.3.4 Water content (MT 40.1, CIPAC 1, p. 932)**

Visible water shall be absent.

---

\* Method available from the Plant Protection Officer, Plant Production and Protection Service.



#### **.4 CONTAINERS**

They should be suitable, clean, dry and as specified in the order and should adequately protect the material from external influences.

They should comply with pertinent national and international transport and safety regulations.

NOTE 1 In the case of mixed esters the approximate content of each shall be stated.

NOTE 2 Interim limit which will be reviewed when collaborative work is complete on determination of free phenols.

NOTE 3 The content of free phenols is limited to avoid possible taint of neighbouring crops and foodstuffs.

NOTE 4 On a 2,4-DB content of 700 g/kg the maximum permitted free phenol content would be 11 g/kg of the material.

**2,4-DB SALT AQUEOUS SOLUTIONS**  
FAO Provisional Specification October 1983  
(83.1/SL|(S)/-)

**.1 DESCRIPTION**

The product shall consist of a 2,4-DB (complying with the FAO Provisional Specifications October 1983) as the active ingredient formulated as a 2,4-DB salt aqueous solution. It shall be free from visible suspended matter or sediment.

**.2 ACTIVE INGREDIENT**

**.2.1 Salt(s)**

The names of the 2,4-DB salt(s) present shall be stated (Note 1).

**.2.2 Identity tests\***

Where the identity of the active ingredient is in doubt the extractable acids shall comply with any two of the following tests:

**.2.2.1 Melting point** (liquefaction point)

114 to 119°C

The melting point shall not be depressed by admixture with an equal quantity of a standard 2,4-DB.

**.2.2.2 IR**

The spectrum produced from the sample shall be consistent with that produced from a standard 2,4-DB.

**.2.2.3 GLC**

The major component in the sample chromatogram shall have the same retention time as that from a standard 2,4-DB chromatographed under identical conditions.

**.2.2.4 TLC**

The major component in the sample chromatogram shall have the same R<sub>f</sub> value as that from a standard 2,4-DB.

---

\* Method available from the Plant Protection Officer, FAO Plant Production and Protection Division.

**.2.3 Extractable acids\***

The extractable acid content expressed as 2,4-DB shall be not more than 1.14x where x is the content of 2,4-DB found under .2.4 (Note 2).

**.2.4 2,4-DB\***

The nominal 2,4-DB content (g/l at 20 C or g/kg; Note 3) shall be declared and when determined the content obtained shall differ from that declared by not more than +/- 5% of the declared content.

**.3 IMPURITIES****.3.1 Free phenols\***

Maximum: 15g/kg (Note 4), expressed as 2,4-dichlorophenol (Note 5), of the 2,4-DB content found under .2.4 (Note 6).

**.3.2 Water insolubles\***

The product shall pass through a 250 µm test sieve and not more than 1 g/kg shall remain on a 150 µm test sieve.

**.4 PHYSICAL PROPERTIES****.4.1 Stability on dilution** (MT 41, CIPAC 1, p. 933)

The product, after dilution with CIPAC Standard Water C, shall give a clear or opalescent solution, i.e., free from more than a trace sediment and/or visible solid particles.

**.5 STORAGE STABILITY****.5.1 Stability at 0 C** (MT 39.2, CIPAC 1, p. 932)

After storage at 0 C (Note 6) for 48 hours there shall be no separation of material from the product.

**.5.2 Stability at 54°C\***

After storage at 54 +/- 2 C for 14 days the product shall continue to comply with .2.4, .3.2, .4.1 and .5.1.

---

\* Method available from the Plant Protection Officer, FAO Plant Production and Protection Division.

## **.6 CONTAINERS**

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

They should comply with pertinent national and international transport and safety regulations.

NOTE 1 In the case of mixed salt formulations the approximate content of each shall be stated.

NOTE 2 On a 2,4-DB content of 500 g/l the maximum permitted extractable acid content would be  $500 \times 1.14$ , i.e., 570 g/l.

NOTE 3 If the buyer requires both g/l at 20 C and g/kg then in cases of dispute the analytical results shall be calculated as g/kg.

NOTE 4 Interim limit which will be reviewed when collaborative work is complete on determination of free phenols.

NOTE 5 The content of free phenols is limited to avoid possible taint of neighbouring crops and foodstuffs.

NOTE 6 On a 2,4-DB content of 400 g/kg the maximum permitted free phenol content would be 6 g/kg of the product.

NOTE 7 A test temperature of 0°C may not be suitable for products intended for use in cold countries, and alternative test temperatures may be specified.

## SUBMISSION OF DRAFT SPECIFICATIONS TO FAO

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

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

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.