



Food and Agriculture  
Organization of the  
United Nations



World Health  
Organization

Residue Monograph prepared by the meeting of the Joint FAO/WHO Expert  
Committee on Food Additives (JECFA), 84th meeting 2017

## **Fast Green FCF**

This monograph was also published in: *Compendium of Food Additive Specifications. Joint FAO/WHO Expert Committee on Food Additives (JECFA), 84th meeting 2017. FAO JECFA Monographs 20*

## FAST GREEN FCF

*Prepared at the 84th JECFA and published in JECFA Monograph 20 (2017) superseding specifications prepared at the 30th JECFA (1986), revised at the 59th JECFA (2002), published in the Combined Compendium of Food Additive Specifications, FAO JECFA Monographs 1 (2005) and corrected at the 69th JECFA (2008). An ADI of 0-25 mg/kg bw was established at the 84th JECFA (2017).*

### SYNONYMS

INS No. 143, CI Food Green 3, CI (1975) No. 42053, FD&C Green No. 3

### DEFINITION

Consists essentially of disodium 3-[*N*-ethyl-*N*-[4-[[4-[[*N*-ethyl-*N*-(3- sulfobenzyl)amino]phenyl](4-hydroxy-2-sulfophenyl)methylene]-2,5-cyclohexadien-1-ylidene]ammoniomethyl]benzenesulfonate and its isomers together with subsidiary colouring matters, as well as sodium chloride and/or sodium sulfate as the principal uncoloured components. It is manufactured by condensing 2-formyl-5-hydroxybenzenesulfonic acid with a mixture of 3-[[*N*-ethyl-*N*-phenylamino)methyl]benzenesulfonic acid and its 2- and 4- isomers to form the leuco base precursor. Oxidation of the leuco base precursor with either chromium or manganese containing compounds produces the dye, which is purified and isolated as the disodium salt.

May be converted to the corresponding aluminium lake in which case only the requirements in the *General Specifications for Aluminium Lakes of Colouring Matters* apply.

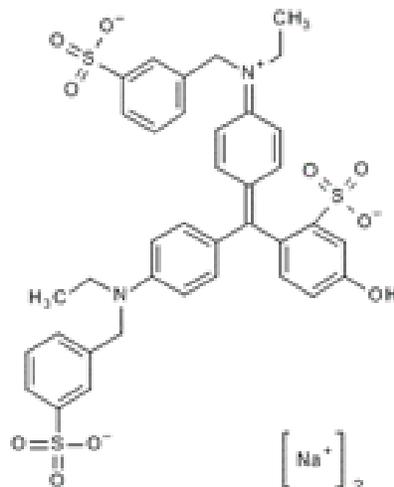
### Chemical names

Disodium 3-[*N*-ethyl-*N*-[4-[[4-[[*N*-ethyl-*N*-(3-sulfobenzyl)amino]-phenyl](4-hydroxy-2-sulfophenyl)methylene]-2,5-cyclohexadien-1-ylidene]-ammoniomethyl]benzenesulfonate;

*N*-ethyl-*N*-[4[[4-ethyl[(3-sulfophenyl)-methyl]amino]phenyl](4-hydroxy-2-sulfophenyl)methylene]-2,5-cyclohexadien-1-ylidene]-3-sulfobenzenemethanaminium hydroxide; inner salt, disodium salt

Disodium;2-[[4-[ethyl-[(3-sulfonatophenyl)methyl]amino]-phenyl]-[4-[ethyl-[(3-sulfonatophenyl)methyl]azaniumylidene]-cyclohexa-2,5-dien-1-ylidene]methyl]-5-hydroxybenzene-sulfonate

C.A.S. number	2353-45-9
Chemical formula	$C_{37}H_{34}N_2Na_2O_{10}S_3$
Structural formula	



Formula weight	808.86
Assay	Not less than 85% total colouring matters
<b>DESCRIPTION</b>	Blue-green or red-brown powder or granules
<b>FUNCTIONAL USES</b>	Colour
<b>CHARACTERISTICS</b>	
<b>IDENTIFICATION</b>	
<u>Solubility</u> (Vol. 4)	Very soluble in water; slightly soluble in ethanol
<u>Spectrophotometry</u> (Vol. 4)	Maximum wavelength approximately 624 nm Determine the UV-visible absorption spectrum of the sample solution dissolved in water.
<b>PURITY</b>	
<u>Loss on drying, chloride and sulfate as sodium salts</u>	Not more than 15% as total amount Determine chloride as sodium chloride, sulfate as sodium sulfate, and water content (loss on drying at 135°) as described in Volume 4 (under "Specific Methods, Food

(Vol. 4)	Colours”).
<u>Water insoluble matter</u> (Vol. 4)	Not more than 0.2%
<u>Subsidiary colouring matters</u>	Not more than 6% See description under TESTS
<u>Organic compounds other than colouring matters</u>	Not more than 0.5%, sum of 2-, 3-, and 4-formylbenzenesulfonic acids, sodium salts  Not more than 0.3%, sum of 3- and 4-[ <i>N</i> -ethyl- <i>N</i> -(4-sulfophenyl)amino]methylbenzenesulfonic acids, disodium salts  Not more than 0.5% of 2-formyl-5-hydroxybenzenesulfonic acid, sodium salt  See description under TESTS
<u>Leuco base</u> (Vol. 4)	Not more than 5.0% Weigh accurately 130±5 mg sample and proceed as directed under <i>Leuco Base in Sulfonated Triarylmethane Colours</i> (Vol. 4) Absorptivity (a) = 156 L/(g·cm) at 624 nm Ratio = 0.971
<u>Un sulfonated primary aromatic amines</u> (Vol. 4)	Not more than 0.01% calculated as aniline
<u>Ether extractable matter</u> (Vol. 4)	Not more than 0.2%
<u>Lead</u> (Vol. 4)	Not more than 2 mg/kg Determine using a method appropriate to the specified level. The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4 (under “General Methods, Metallic Impurities”).
<u>Chromium</u> (Vol. 4)	Not more than 50 mg/kg Determine using a method appropriate to the specified level. The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4 (under “General Methods, Metallic Impurities”).
<u>Manganese</u> (Vol. 4)	Not more than 100 mg/kg Determine using a method appropriate to the specified level.

The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4 (under “General Methods, Metallic Impurities”).

## TESTS

### PURITY TESTS

#### Subsidiary colouring matters (Vol. 4)

Determine subsidiary colouring matters content by reversed-phase HPLC (Vol. 4) using the following conditions:

- Column: C18 (150 mm x 2.1 mm i.d., 5 µm particle size)
- Eluent A: 0.05 M ammonium acetate in water
- Eluent B: 0.05 M ammonium acetate in methanol
- Injection volume: 2 µl
- Column temperature: 25°
- Detector: UV-visible/PDA at 624 nm
- Flow rate: 0.25 mL/min

Gradient:

Elution time (min)	Eluent A (%)	Eluent B (%)
0	100	0
8	63	37
16	55	45
33.5	49	51
48.5	0	100
48.6	100	0
60	100	0

Standards:

- Subsidiary colouring matters – synthesized materials
- Fast Green FCF (C.A.S. No. 2353-45-9) – TCI, Cat. No. F0146 or equivalent (use if subsidiary colouring matter standards are not available)

### Sample preparation

Weigh accurately  $500 \pm 5$  mg sample and dissolve in 100 mL of water. Dilute the solution, if required, to separate subsidiary colours from the primary colour component.

### Calculations

Construct the relevant standard curves. Integrate all peaks of the chromatograph obtained at 624 nm. If Fast Green FCF is used as the standard, calculate the ratio of the sum of all peaks not corresponding to Fast Green FCF to the sum of all peaks.

### Organic compounds other than colouring matters (Vol. 4)

Determine organic compounds other than colouring matters content by reversed-phase HPLC (Vol. 4) using the above conditions for subsidiary colouring matters except:

Detector: UV-visible/PDA at 246 nm

### Standards:

- 2-Formylbenzenesulfonic acid, sodium salt (C.A.S. No. 1008-72-6) – Sigma-Aldrich, Cat. No. 12050 or equivalent (use for quantitating the 2-, 3-, and 4- isomers)
- 3-[[N-ethyl-N-(4-sulfophenyl)amino]methyl]benzenesulfonic acid, calcium salt (C.A.S. No. 5363-53-1, acid form) – Wako, Cat. No. 031-23071 or equivalent (use for quantitating the 3- and 4- isomers)
- 2-formyl-5-hydroxybenzenesulfonic acid, sodium salt (C.A.S. Nos. 106086-27-5, acid form; 119557-97-0, sodium salt) – Wako, Cat. No. 191-17231 or equivalent

### Sample preparation

Weigh accurately  $500 \pm 5$  mg sample and dissolve in 100 mL of water.

### Calculations

Construct the relevant standard curves. Calculate the sum of 2-, 3-, and 4-formylbenzenesulfonic acids as their sodium salts, the sum of 3- and 4-[[N-ethyl-N-(4-sulfophenyl)amino]methyl]benzenesulfonic acids as their disodium salts, and 2-formyl-5-hydroxybenzenesulfonic acid as its sodium salt.

**METHOD OF ASSAY**  
(Vol. 4)

Determine total colouring matters content by spectrophotometry using Procedure 1 in Volume 4 (under “Specific Methods, Food Colours”) and an appropriate solvent.

Using 0.04 M aqueous ammonium acetate as the solvent:  
absorptivity ( $a$ ) = 156 L/(g·cm) and wavelength of maximum absorbance = 624 nm.