TURMERIC OLEORESIN

Prepared at the 35th JECFA (1989), published in FNP 49 (1990) and in FNP 52 (1992). Metals and arsenic specifications revised at the 59th JECFA (2002). A temporary ADI established at the 30th JECFA (1986) was not maintained at the 35th JECFA (1989)

DEFINITION

Obtained by solvent extraction of turmeric (*Curcuma longa* L.). Only the following solvents may be used in the extraction: acetone, dichloromethane, 1,2-dichloroethane, methanol, ethanol, isopropanol and light petroleum (hexanes).

The selection of a turmeric oleoresin of a particular composition is based on the intended use in food. In general, all turmeric oleoresins contain colouring matter and most contain flavouring matter but some oleoresins are processed to remove aromatic compounds. Commercial products include oleoresins (per se) and formulations in which oleoresin is diluted in carrier solvents and which may contain emulsifiers and antioxidants.
Purified extracts of turmeric containing more than 90% total colouring matter are subject to specifications for "Curcumin".
Turmeric Oleoresins are sold on the basis of "colour value" or "curcumin content", which generally means the total content of the curcuminoid substances: (I) curcumin, (II) demethoxycurcumin and (III) bis-demethoxycurcumin.

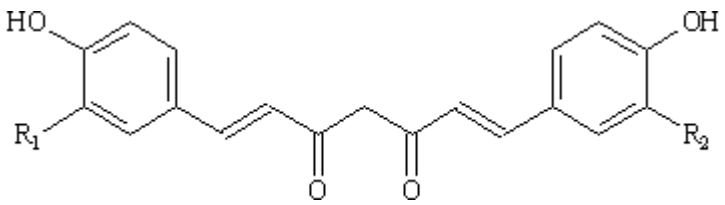
Chemical names

The principle colouring components are:
I. 1,7-Bis(4-hydroxy-3-methoxyphenyl)hepta-1,6-diene- 3,5-dione
II. 1-(4-Hydroxyphenyl)-7-(4-hydroxy-3-methoxyphenyl)-hepta-1,6-diene-3,5-dione
III. 1,7-bis(4-hydroxyphenyl)hepta-1,6-diene-3,5-dione

Chemical formula

Chemical formula
I. $C_{21}H_{20}O_6$
II. $C_{20}H_{18}O_5$
III. $C_{19}H_{16}O_4$

Structural formula



I. $R_1 = R_2 = -OCH_3$
II. $R_1 = -OCH_3$, $R_2 = H$
III. $R_1 = R_2 = H$

Formula weight

I. 368.39
II. 338.39
III. 308.39

Assay

Content of total colouring matter (curcuminoid content) not less than declared.

DESCRIPTION

Turmeric Oleoresins, *per se*, are deep brownish-orange viscous oily fluids, pasty semisolids or hard amorphous solids containing 37-55% curcuminoids and up to 25% volatile oil. Diluted turmeric oleoresin formulations are, generally yellow solutions containing 6-15% curcuminoids and nil to 10% volatile oil.

FUNCTIONAL USES

Colour, flavouring agent

CHARACTERISTICS

IDENTIFICATION

Solubility (Vol. 4): Insoluble in water

Colour in ethanol: The ethanol-soluble fraction of the sample is characterized by its pure yellow colour and light green fluorescence; if this ethanol extract is added to concentrated sulfuric acid, a deep crimson is produced.

Boric acid test: Treat an aqueous or dilute ethanolic suspension of the sample with hydrochloric acid until a slightly orange colour begins to appear. Divide mixture into 2 parts and add some boric acid powder or crystals to one portion. Marked reddening will be quickly apparent, best seen by comparison with the portion to which the boric acid has not been added. The test may also be made by dipping pieces of filter paper into an ethanolic suspension of the sample, drying at 100°, and then moistening with a weak solution of boric acid to which a few drops of hydrochloric acid have been added. On drying, a cherry red colour will develop.

PURITY

Residual solvents (Vol. 4): Acetone : Not more than 30 mg/kg
Methanol: Not more than 50 mg/kg
Ethanol: Not more than 50 mg/kg
Isopropanol: Not more than 50 mg/kg
Dichloromethane and 1,2-dichloroethane: Not more than 30 mg/kg, singly or in combination
Light petroleum (hexanes): Not more than 25 mg/kg

Arsenic (Vol. 4): Not more than 3 mg/kg

Lead (Vol. 4): Not more than 2 mg/kg
Determine using an atomic absorption technique 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, “Instrumental Methods.”

METHOD OF ASSAY

Method I

Standard Preparation
Transfer about 250 mg of purified curcumin, accurately weighed, into a 100-ml volumetric flask, and record the weight as W, in mg. Dissolve in acetone, dilute to volume with acetone, and mix. Pipet a 1-ml portion of this solution into a second 100-ml volumetric flask, dilute to volume with acetone, and

mix. Finally, pipet a 5-ml portion of the last solution into a 50-ml volumetric flask, dilute to volume with acetone, and mix.

Sample Preparation
Transfer an accurately weighed amount of the sample, equivalent to about 250 mg of curcumin, into a 100-ml volumetric flask, and record the weight as w, in mg. Dissolve in acetone, dilute to volume with acetone, and mix. Pipet a 1-ml portion of this solution into a second 100-ml volumetric flask, dilute to volume with acetone, and mix. Finally, pipet a 5-ml portion of the last solution into a 50-ml volumetric flask, dilute to volume with acetone, and mix.

Procedure
Determine the absorbance of each solution in 1-cm cells at the wavelength of maximum absorption at about 421 nm with a suitable spectrophotometer, using acetone as the blank.

Calculate the percentage of curcumin in the sample by the formula:

$$100 \times \frac{W}{w} \times \frac{A_U}{A_S}$$

where
A_U = the absorbance of the Sample Preparation
A_S = the absorbance of the standard preparation.
(NOTE: The absorbance readings should be made as soon as possible after the solutions are prepared to avoid colour loss).

Method II
Accurately weigh (W) about 0.1 g of the sample in a 100-ml beaker. Add 50 ml of ethanol and extract the colour by vigorously stirring. Filter the solution into a 200-ml volumetric flask. Make up to volume with ethanol.
Take an aliquot of the colour solution and dilute with additional ethanol according to the estimated colouring matters content as follows:

Colouring matter content	*Dilution factor*
Less than 20%	20
Between 20 and 40%	50
More than 40%	100

Determine the absorbance (A) at 425 nm in a 1-cm cell.
Calculate the total colouring matters content of the sample by the formula:

$$\frac{A \times 10000 \times D}{W \times 1607}$$

where
D = 0.4, 1 and 2 for dilution factors of 20, 50, and 100, respectively.