Geraniol

Botanical Source

Synonyms DIMETHYL-2,6-OCTADIEN-1-OL (trans-3,7-);
DIMETHYL OCTA-2,6-DIEN-1-OL (trans-3,7-);
DIMETHYL-2,6-OCTADIEN-8-OL (trans-2,6)

IUPAC Name

CAS Reference 106-24-1

E Number

Food Legislation

Council of Europe (CoE)	
Number	Comment
60	Listed by the Council of Europe as acceptable for use in food.

US Food and Drug Administration	
Number	Comment
182.60	Approved by the US FDA. FDA 21 CFR 182.60

Joint FAO/WHO Expert Committee on Food Additives (JECFA)		
Number	ADI	Comment
1223	640	ADI 0-0.5 mg/kg bw

FEMA	
FEMA No.	Comment
2507	Generally recognised as safe as a flavour ingredient:GRAS List Number 9

Natural Occurrence and Use in Food
Found in apples, apricot, beer, bilberry, blackcurrants, blackberries; used in baked goods, candy, ice cream.

Estimated Intake from Food and Drink	
Daily Intake mg/kg/day	FEMA Possible Average Daily Intake mg
0.001649	3.42

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Tobacco Product Related Chemical and Biological Studies for Ingredients Added in a Mixture

Smoke Chemistry		
Published Source	Level Tested %	Comment
BAT	0.00200	At maximum application level this ingredient is not associated with significant increases in levels of Hoffmann analytes in smoke.
Philip Morris	0.00010	An overall assessment of the data suggests that this ingredient did not add to the toxicity of smoke.

Ames Activity		
Published Source	Level Tested %	Comment
BAT	0.00200	Within the sensitivity and specificity of the system the Ames activity of the cigarette smoke condensate was not increased by the addition of the ingredient.
Philip Morris	0.00010	Within the sensitivity and specificity of the system the Ames activity of the cigarette smoke was not increased by the addition of the ingredient.

Micronucleus		
Published Source	Level Tested %	Comment
BAT	0.00200	Within the sensitivity of the in vitro micronucleus assay the activity of the cigarette smoke condensate was not increased by the addition of the ingredient.

Neutral Red		
Published Source	Level Tested %	Comment
BAT	0.00200	Within the sensitivity of the test system the in vitro cytotoxicity of the cigarette smoke condensate was not increased by the addition of the ingredient.
Philip Morris	0.00010	Within the sensitivity of the test system the in vitro cytotoxicity of the cigarette smoke was not increased by the addition of the ingredient.

Inhalation		
Published Source	Level Tested %	Comment
BAT	0.00200	The results indicate that the addition of the ingredient had no discernible effect on the inhalation toxicity of mainstream smoke.
Philip Morris	0.00010	The data indicate that the addition of the ingredient, when added with one of three groups, did not increase the inhalation toxicity of the smoke.

Mouse Skin Painting		
Published Source	Level Tested %	Comment

References

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Carmines EL. Evaluation of the potential effects of ingredients added to cigarettes. Part 1: cigarette design, testing approach, and review of results. Food Chem Toxicol. 2002; 40(1): 77-91.

Rustemeier K, Stabbert R, Haussmann HJ, Roemer E, Carmines EL. Evaluation of the potential effects of ingredients added to cigarettes. Part 2: chemical composition of mainstream smoke. Food Chem Toxicol. 2002; 40(1): 93-104.

Roemer E, Tewes FJ, Meisgen TJ, Veltel DJ, Carmines EL. Evaluation of the potential effects of ingredients added to cigarettes. Part 3: in vitro genotoxicity and cytotoxicity. Food Chem Toxicol. 2002; 40(1): 105-111.

Vanscheeuwijck PM, Teredesai A, Terpstra PM, Verbeeck J, Kuhl P, Gerstenberg B, Gebel S, Carmines EL. Evaluation of the potential effects of ingredients added to cigarettes. Part 4: subchronic inhalation toxicity. Food Chem Toxicol. 2002; 40(1): 113-131.

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Tobacco Product Related Chemical and Biological Studies for Ingredients Tested Singly

References
Baker RR, Bishop LJ. The pyrolysis of tobacco ingredients. J. Anal. Appl. Pyrolysis 2004, 71, 223-311.

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Toxicological Data on the Unburnt Ingredient

[+ve, positive; -ve, negative; ?, equivocal; with, with metabolic activation; without, without metabolic activation]

In vitro

Chinese hamster fibroblast cell line, CHL	Cells exposed at up to 0.125 mg/ml and examined for numerical and structural chromosome aberrations	Chromosome damage and changes in chromosome number	without	-ve for structural damage, equivocal for polyploidy (8% incidence) [limited study, no activation used]	Ishidate *et al.* 1984
Chinese hamster ovary cells (CHO-K1)	Cells exposed at up to a toxic concentration (1 mM), alone or with a genotoxin (MMC), then examined for sister chromatid exchanges (SCEs)	Chromosome effects Inhibition of MMC-induced SCEs	without without	-ve no inhibitory effect	Sasaki *et al.* 1989
Salmonella typhimurium, strains TA98 and TA100	Tested at up to 16 ppm	Mutation	with and without S9	-ve limited study, at least 4 strains are recommended	Kono *et al.* 1995 (cited in CCRIS, 2003)

Salmonella typhimurium, strains TA92, TA94, TA98, TA100, TA1535 and TA1537 [and possibly TA2637]	Tested at up to 0.5 mg/plate (the highest non-cytotoxic concentration)	Mutation	with and without S9	-ve (a good quality study)	Ishidate *et al.* 1984
Salmonella typhimurium, strains TA98, TA100, TA1535 and TA1537	Tested at up to 3 µmol/plate (0.5 mg/plate) in the spot test	Mutation	with and without S9	-ve (a spot test is only a limited assay)	Florin *et al.* 1980
Salmonella typhimurium, strain TA100	Tested at up to 1 µl/2 ml incubation volume (<10% survival) in a liquid suspension test	Mutation	with and without S9	-ve (limited study, only 1 strain used)	Eder *et al.* 1980
Bacillus subtilis strains M45 and H17	Tested at up to 16 µg/disc in a rec assay measuring differential toxicity	DNA damage (indicative test)	without	-ve (Japanese paper, with English summary and tables)	Oda *et al.* 1978

References

CCRIS (2003). Chemical Carcinogenesis Research Information System. CCRIS Record Number 7243. http://toxnet.nlm.nih.gov/cgi-bin/sis/search

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Kono M *et al* (1995). Antimicrobial activity and mutagenicity of allyl isothiocyanates and several essential oils from spices. Kinki Daigaku Nogakubu Kiyo, 28, 11-19 (cited in CCRIS, 2003).

Oda Y *et al* (1978). Mutagenicity of food flavours in bacteria (1st report). Osaka-Furitsu Koshu Eisei Kenkyu Shokuhin Eisei Hen, 9, 177-181.

Sasaki Y F *et al* (1989). Modifying effects of components of plant essence on the induction of sister chromatid exchanges in cultured Chinese hamster ovary cells. Mutation Research, 226, 103-110.