

Dill seed oil

Botanical Source	Anethum graveolens
Synonyms	DILL SEED OIL, EUROPEAN; DILL SEED OIL, AMERICAN; DILL SEED OIL, ENGLISH;
IUPAC Name	DILL SEED OIL, ENGLISH
CAS Reference	8016-06-6
E Number	

Food Legislation

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

US Food and Drug Administration	
Number	Comment
184.1282	Approved by the US FDA. FDA 21 CFR 184.1282

Joint FAO/WHO Expert Committee on Food Additives (JECFA)		
Number	ADI	Comment
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FEMA	
FEMA No.	Comment
2383	Generally recognised as safe as a flavour ingredient:GRAS List Number 3

Natural Occurrence and Use in Food
Found in dill; used in cheese, meats, sauces, dips, baked goods.

Estimated Intake from Food and Drink	
Daily Intake mg/kg/day	FEMA Possible Average Daily Intake mg
0.18	23.99

Dill seed oil

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

Smoke Chemistry		
Published Source	Level Tested %	Comment
BAT	0.00100	At maximum application level this ingredient is not associated with significant increases in levels of Hoffmann analytes in smoke.

Ames Activity		
Published Source	Level Tested %	Comment
BAT	0.00100	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.

Micronucleus		
Published Source	Level Tested %	Comment
BAT	0.00100	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	0.00100	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.

Inhalation		
Published Source	Level Tested %	Comment
BAT	0.00100	The results indicate that the addition of the ingredient had no discernible effect on the inhalation toxicity of mainstream smoke.

Mouse Skin Painting		
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Published Source	Level Tested %	Comment
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References
Baker RR, Pereira da Silva JR, Smith G. The effect of tobacco ingredients on smoke chemistry. Part I: Flavourings and additives. Food Chem Toxicol. 2004; 42 Suppl:S3-37.
Baker RR, Pereira da Silva JR, Smith G. The effect of tobacco ingredients on smoke chemistry. Part II: casing ingredients. Food Chem Toxicol. 2004; 42 Suppl:S39-52.
Baker RR, Massey ED, Smith G. An overview of the effects of tobacco ingredients on smoke chemistry and toxicity. Food Chem Toxicol. 2004; 42 Suppl:S53-83.

Dill seed oil

Tobacco Product Related Chemical and Biological Studies for Ingredients Tested Singly

References
Baker RR, Bishop LJ. The pyrolysis of non-volatile tobacco ingredients using a system that simulates cigarette combustion conditions. J. Anal. Appl. Pyrolysis 2005, 74, 145-170.

Dill seed oil

Toxicological Data on the Unburnt Ingredient

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

In vivo

Species	Test conditions	Endpoint	Results	Reference
<i>Drosophila melanogaster</i>	Somatic mutation and recombination test (SMART). Males mated with virgin females and resulting 3-day old larvae exposed for approximately 48 hr (until pupation) to a medium containing dill herb essential oil (up to 1% concentration) or dill seed essential oil (up to 1.5% concentration). Upon hatching, wings were examined for single and twin spots.	Mutation/mitotic recombination	+ve for dill herb oil ? for dill seed oil (+ve at highest dose only, no clear evidence of a dose-response)	Lazutka et al. 2001 (see also next entry)
<i>Drosophila melanogaster</i>	Somatic mutation and recombination test (SMART). Larvae grown until pupation	Mutation/mitotic recombination	+ve	Mierauskiene et al. 2000 (probably part of the same work as the

	(approximately 48 hr) in a medium containing up to 0.75% dill (<i>Anethum graveolens</i>) essential oil. Upon hatching, wings examined for single and twin spots. Insecticidal activity was observed – in a preliminary experiment only 60% of adult flies survived exposure to the highest test concentration.			above entry)
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In vitro

Test system	Test conditions	Endpoint	Activation status	Results	Reference
Human white blood cells (lymphocytes) in whole peripheral blood culture	Chromosome aberration (CA) and sister chromatid exchange (SCE) assays. Cells exposed for 24 hr to dill herb essential oil or dill seed essential oil (up to 0.25-0.30 ul/ml), then examined in metaphase for CAs and SCEs.	Chromosome damage/ chromosome effects	Without	+ve for CAs +ve for SCEs	Lazutka et al. 2001 (see also next entry)
Human white blood cells (lymphocytes)	CA and SCE assays. Cells treated for 24 hr with dill (<i>Anethum graveolens</i>) essential oil (up to 0.25 ul/ml), then examined for CAs and SCEs.	Chromosome damage/ chromosome effects	Without	+ve for CAs +ve for SCEs	Mierauskienė et al. 2000 (probably part of the same work as the above entry)
<i>Salmonella typhimurium</i> , strains TA98, TA1535, TA1537, TA1538	Ames assay. Dill essential oil tested reportedly at 0, 5 and 10 picolitres/plate.	Mutation	Without	Reported as +ve (in strain TA1537 only) [The study is unreliable as the spontaneous mutation rate was very high and unrealistically low levels, picolitres/	Sivaswamy et al. 1991

				plate, were used]	
<i>Salmonella typhimurium</i> , strains TA98, TA100	Ames assay. "50% aqueous-methanol extract" of dill seeds ("A. sowa") and "flavonol sulphate fractions" tested. No further details provided in citing source.	Mutation	With microsomal activation (not further defined in citing source)	+ve	Fukuoka et al. 1980
<i>Salmonella typhimurium</i> , strains TA98, TA100	Ames assay. Chloroform-methanol extract and water extract of dill weed and dill seed tested at up to 100 mg [presumably equivalents]/plate.	Mutation	With S9	-ve for water extracts of dill weed and dill seed -ve for chloroform-methanol extract of dill weed ? for chloroform-methanol extract of dill seed - extract was toxic to <i>S. typhimurium</i> Limited assay, as only 2 strains tested	Rockwell & Raw, 1979
<i>Salmonella typhimurium</i> , strains TA98, TA100	Ames assay. Dill herb and dill seed essential oils tested. No further details	Mutation	Not known	-ve (the oils were said to be very toxic to the bacterial	Lazutka et al. undated

	provided in citing source.			strains) limited assay, as only 2 strains tested	
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References

Fukuoka M. et al. (1980). Characterization of mutagenic principles and carcinogenicity test of dill weed and dill seeds. *Journal of Pharmacobio-dynamics* 3, 236-244 (cited in Opdyke, 1982).

Ishidate M. et al. (1988). Results of mutagenicity screening of food additives (part 9). *Tokishikoroji Foramu (Toxicology Forum)* 11, 663-669.

Lazutka J.R. et al. (undated). Unpublished results (cited in Lazutka et al. 2001).

Lazutka J.R. et al. (2001). Genotoxicity of dill (*Anethum graveolens* L.), peppermint (*Mentha x piperita* L.) and pine (*Pinus sylvestris* L.) essential oils in human lymphocytes and *Drosophila melanogaster*. *Food and Chemical Toxicology* 39, 485-492.

Mierauskiene J. et al. (2000). Genotoxicity of dill (*Anethum graveolens*) essential oil in human lymphocytes in vitro and in *Drosophila melanogaster* somatic cells in vivo. *Biologija* 2, 22.

Opdyke D.L.J. (1982). Monographs on fragrance raw materials: dill seed oil, Indian. *Food and Cosmetics Toxicology* 20, 673.

Phillips D.H. et al. (1984). 32P-Post-labelling analysis of DNA adducts formed in the livers of animals treated with safrole, estragole and other naturally-occurring alkenylbenzenes. 2. Newborn male B6C3F1 mice. *Carcinogenesis (London)* 5, 1623-1628.

Pottenger L.H. et al. (2004). Biological significance of DNA adducts: summary of discussion of expert panel. *Regulatory Toxicology and Pharmacology* 39, 403-408.

Randerath K. et al. (1984). 32P-Post-labelling analysis of DNA adducts formed in the livers of animals treated with safrole, estragole and other naturally-occurring alkenylbenzenes. 1. Adult female CD-1 mice. *Carcinogenesis (London)* 5, 1613-1622.

Rockwell P. & Raw I. (1979). A mutagenic screening of various herbs, spices and food additives. *Nutrition and Cancer* 1, 10-15.

Sivaswamy S.N. et al. (1991). Mutagenic activity of south Indian food items. *Indian Journal of Experimental Biology* 29, 730-737.

