Role of sulfur compounds in vegetable and mushroom aroma

Monika A. Marcinkowska, and Henryk H. Jeleń*

Faculty of Food Science and Nutrition, Poznań University of Life Sciences, Wojska Polskiego 31, 60-624 Poznań, Poland; monika.marcinkowska@up.poznan.pl
* Correspondence: henrykj@up.poznan.pl; Tel.: +48-618-487-273

Supplementary file

Table S1. Variety of sulfur compounds in vegetables and mushrooms.

Class of Sulfur Compound	Name	Occurrence in vegetable (family)	Odor quality	Reference
Isothiocyanates	allyl isothiocyanate	*Brassicaceae*	pungent, onion-like	[1,2]
	3-butenyl isothiocyanate	*Brassicaceae*	pungent, garlic-like	[1,2]
	benzyl isothiocyanate	*Brassicaceae*	herb-like, sweaty, pungent	[1,2]
	1-isothiocyanato-4-(methylsulfanyl)butane	*Brassicaceae*	mushroom-like, broth-like	[1]
	(2-isothiocyanatoethyl)benzene	*Brassicaceae*	broth-like, vegetable-like	[1]
	isopropyl isothiocyanate	*Brassicaceae*	pungent, grassy	[3]
	sec-butyl isothiocyanate	*Brassicaceae*	radish-like, vegetative	[3]
	isobutyl isothiocyanate	*Brassicaceae*	cooked, pungent, sulphury	[3]
	butyl isothiocyanate	*Brassicaceae*	peppery, sulphurous, oniony	[3]
	isoamyl isothiocyanate	*Brassicaceae*	pungent, grassy	[3]
	4-pentenyl isothiocyanate	*Brassicaceae*	pungent, peppery, sulphurous, musty	[3]
	pentyl isothiocyanate	*Brassicaceae*	cabbage, green, rotten	[3]
	octyl isothiocyanate	*Brassicaceae*	green, vegetative	[3]
Nitriles and Epithionitriles	3-hydroxy-4-pentanenitrile	*Brassicaceae*	nf	[4]
	β-hydroxy-thiiranepropanenitrile	*Brassicaceae*	nf	[4]
	3-butenenitrile	*Brassicaceae*	grassy, pungent	[4]
	2-butenenitrile	*Brassicaceae*	pungent	[5]

	thiiraneacetonitrile	*Brassicaceae*	sweaty, onion-like, pungent	[2–4]
	4-pentanenitrile	*Brassicaceae*	nf	[4]
	3-pentanenitrile	*Brassicaceae*	pungent	[5]
	thiiranepropanenitrile	*Brassicaceae*	nf	[4]
	5-hexanenitrile	*Brassicaceae*	pungent	[4,5]
	thiiranebutanenitrile	*Brassicaceae*	nf	[4]
	phenyl-3-propanenitrile	*Brassicaceae*	nasturtium	[4,6]
	3-methyl-3-butenenitrile	*Brassicaceae*	nf	[5]
	5-(methanesulfinyl)pentanenitrile	*Brassicaceae*	broth-like, onion-like, sulfurous	[1]
	4-(methylsulfanyl)butanenitrile	*Brassicaceae*	broth-like, garlic-like, sulfurous	[1]
	5-(methylsulfanyl)pentanenitrile	*Brassicaceae*	broccoli-like, cabbage-like	[1]
	phenylacetonitrile	*Brassicaceae*	mushroom-like	[1]
	5-methylhexanenitrile	*Brassicaceae*	nf	[3]
	6-heptenenitrile	*Brassicaceae*	nf	[3]
	benzenepropanenitrile	*Brassicaceae*	herbal, green, floral	[3]
Sulfides and Polysulfides	hydrogen sulfide	*Brassicaceae*, *Caprifoliaceae*, *Amaranthaceae*	rotten eggs	[7,8]
	dimethyl sulfide	*Brassicaceae*, *Amaryllidaceae*, *Caprifoliaceae*, *Amaranthaceae*, *Asteraceae*, *Solanaceae*, *Tuberaceae*	cooked asparagus-like, putrid	[7–13]
	dimethyl disulfide	*Brassicaceae*, *Amaryllidaceae*, *Solanaceae*, *Tuberaceae*	cabbage-like, sulfuric	[1,7,11–14]
	dimethyl trisulfide	*Brassicaceae*, *Amaryllidaceae*, *Fabaceae*, *Solanaceae*, *Tuberaceae*	sulfuric, cabbage-like	[1,7,10,12–14]
	dimethyl tetrasulfide	*Amaranthaceae*	cabbage-like, rotten	[7,15]
	methyl 2-methyl-3-furyl disulfide	*Brassicaceae*	meat-like, cabbage-like	[1]
	methyl propyl disulfide	*Amaryllidaceae*	onion-like	[7,16]
	propyl allyl disulfide	*Amaryllidaceae*	onion-like	[16,17]
	dipropyl disulfide	*Amaryllidaceae*	onion-like	[7,16]
	methyl propyl trisulfide	*Amaryllidaceae*	onion-like, cabbage-like	[7,16]
	dipropyl trisulfide	*Amaryllidaceae*	onion-like, metallic	[7,16]

	2-propenyl propyl trisulfide	*Amaryllidaceae*	onion-like	[16,17]
	ethyl methyl disulfide	*Amaryllidaceae*, *Solanaceae*	white truffles-like	[11,14,18]
	diallyl sulfide	*Amaryllidaceae*	garlic-like	[7,14]
	allyl methyl disulfide	*Amaryllidaceae*	garlic-like	[7,14]
	ethyl propyl disulfide	*Amaryllidaceae*	sulphurous, green, vegetable-like	[6,14]
	butyl methyl disulfide	*Amaryllidaceae*	nf	[14]
	ethyl methyl trisulfide	*Amaryllidaceae*	garlic-like, green, onion-like	[6,14]
	diallyl disulfide	*Amaryllidaceae*	garlic-like	[7,14]
	dipropyl disulfide	*Amaryllidaceae*	onion-like	[7,14]
	allyl methyl trisulfide	*Amaryllidaceae*	garlic-like	[7,14]
	methyl propyl trisulfide	*Amaryllidaceae*	onion-like, cabbage-like	[7,14]
	dimethyl tetrasulfide	*Amaryllidaceae*	sulfurous	[6,14]
	butyl methyl trisulfide	*Amaryllidaceae*	nf	[14]
	diallyl trisulfide	*Amaryllidaceae*	garlic-like	[7,14]
	dipropyl trisulfide	*Amaryllidaceae*	onion-like, metallic	[7,14]
	methyl pentyl tetrasulfide	*Amaryllidaceae*	nf	[14]
	dipropyl tetrasulfide	*Amaryllidaceae*	cooked onion-like	[7,14]
	allyl propyl tetrasulfide	*Amaryllidaceae*	nf	[14]
	propyl methyl pentasulfide	*Amaryllidaceae*	nf	[14]
	bis(methylthio)methane	*Tuberaceae*	white truffle-like	[12,13]
Thiols	pentane-1-thiol	*Brassicaceae*	burned, rubber-like	[1]
	(1S)-1-phenylethane-1-thiol	*Brassicaceae*	burned	[1]
	2-phenylethane-1-thiol	*Brassicaceae*	rubber-like	[1]
	1-propanethiol	*Amaryllidaceae*	leek-like, onion-like	[17]
	2-propene-1-thiol	*Amaryllidaceae*	garlic-like	[10]
	methanethiol	*Brassicaceae*, *Caprifoliaceae*, *Amaranthaceae*, *Solanaceae*, *Tuberaceae*	sulfurous, gasoline-like, garlic-like	[8,11,13,19]
	ethanethiol	*Solanaceae*	rotten, onion-like	[7,11]
	butanethiol	*Solanaceae*	garlic-like, burned, rubber-like	[7,11]
	1-menthen-8-thiol	*Brassicaceae*	grape-like, resinous, woody	[20]
Miscellaneous	methionol	*Brassicaceae*, *Liliaceae*, *Tuberaceae*	cooked potato-like	[1,21,22]
	methional	*Brassicaceae*, *Amaryllidaceae*,	cooked potato-like	[7,12,13,23–25]

	Solanaceae, *Tuberaceae*		
thiophene-2-carbaldehyde	*Brassicaceae*	roasty	[1]
4-methyl-5-thiazoleethanol	*Brassicaceae*	broth-like, sulfurous, nutty	[1]
dimethyl sulfone	*Brassicaceae*	sulfurous	[19]
dimethyl sulfoxide	*Brassicaceae*, *Asteraceae*, *Tuberaceae*	garlic-like, mushroom-like	[9,19,22]
1,3-thiazole	*Brassicaceae*	roasty	[5]
5-methyl-1,3-thiazole	*Brassicaceae*	roasty, meat-like	[5]
5-ethyl-1,3-thiazole	*Brassicaceae*	roasty	[5]
2-methyl-3-furanthiol	*Brassicaceae*, *Tuberaceae*	meat-like, onion-like	[5,12]
S-methyl thioacetate	*Liliaceae*	warm, cooked-like	[21]
2,4-dimethylthiophene	*Amaryllidaceae*	nf	[16]
2,5-dimethylthiophene	*Amaryllidaceae*	nutty, sulfurous	[6,16]
3,4- or 2,4-dimethyl thiophen	*Amaryllidaceae*	wood, dry smell, green, bookstore	[17]
2-acetylthiazole	*Brassicaceae*, *Solanaceae*	roasty, popcorn-like	[1,7,11]
benzothiazole	*Brassicaceae*, *Asteraceae*, *Solanaceae*	rubber-like, cabbage-like	[1,9,11]
cycloalliin	*Amaryllidaceae*	nf	[26]
S-methyl-L-cysteine sulfoxide (methiin)	*Brassicaceae*, *Amaryllidaceae*	odourless	[26–28]
S-propyl-L-cysteine sulfoxide (propiin)	*Amaryllidaceae*	odourless	[26,27]
S-allyl-L-cysteine sulfoxides (alliine)	*Amaryllidaceae*	odourless	[26,27]
S-propenyl-1-L-cysteine sulfoxides (isoalliin)	*Amaryllidaceae*	odourless	[26,27]
2-propenyl sulfenic acid	*Amaryllidaceae*	nf	[29]
(*E*)-1-propenyl sulfenic acid	*Amaryllidaceae*	nf	[29]
diallyl thiosulfinate (allicin)	*Amaryllidaceae*	freshly crushed garlic-like	[30]
methylmethanethiosulfinate	*Brassicaceae*, *Amaryllidaceae*	freshly cut onion-like	[27,31]
1-propenyl thiosulfinates	*Amaryllidaceae*	freshly cut onion-like	[27,31]
3-vinyl-4*H*-1,2-dithiin	*Amaryllidaceae*	garlic-like	[23]
2-vinyl-4*H*-1,3-dithiin	*Amaryllidaceae*	pungent, garlic-like	[23]
5-methyl-2-thiophenecarboxaldehyde	*Amaryllidaceae*	aniseed-like	[23]
1,2,4-trithiolane	*Omphalotaceae*	sulfury, onion-like	[7,32]
1,2,4,5-tetrathiane	*Omphalotaceae*	sulfury, burned	[7,32]

lenthionine	*Omphalotaceae*	sulfury, burned	[32,33]
hexathiepane	*Omphalotaceae*	nf	[32]
cyclic octaatomiac sulfur	*Omphalotaceae*	nf	[32]
2-methyl-4,5-dihydrothiophene	*Tuberaceae*	aged cheese-like, rubber-like	[12,13]
3-methyl-4,5-dihydrothiophene	*Tuberaceae*	onion-like, truffle-like	[12]

nf, not found.

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