

## **Enhancement of the flavor and functional characteristics of cod protein isolate using enzyme-microbe system**

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Table S1 Analysis of flavor compounds in different samples

Compounds	Content ( $\mu\text{g}\cdot\text{g}^{-1}$ )			Odor description
	CPI	Syn3	Syn4	
<b>Aldehyde</b>				
Heptanal	27.45	34.54	11.71	Fishy odor, rancid taste, and oleogustus
(Z)-3-hexenal	27.07	-	-	Almond odor, bitterness, and grassy odor
(Z) 4-Heptanal	8.71	-	-	Oleogustus and fishy odor
Isoprenol	-	-	2.62	-
Octanal	33.62	28.2	6.74	Grassy odor and rancid taste
Nonanal	351.32	142	-	Fishy odor, rancid taste, oleogustus, and grassy odor
Benzaldehyde	242.52	1227.83	-	Almond odor, nutty, and cherry odor
Phenylacetaldehyde	450.58	-	-	Honey flavor, sweet taste, and floral fragrance
2,4-Dimethylbenzaldehyde	-	304.25	-	Caramel flavor
2,5-Dimethylbenzaldehyde	28.01	-	-	Floral fragrance
Furfural	-	842.4	28.24	Sweetness, woody, and almond odor
Decanal	-	-	68.52	Sweetness, citrus scent, wax scent, and floral fragrance
Nutmeg aldehyde	64.36	29.08	17.19	Oleogustus and creamy
Pentadecanal	44.74	-	-	-
Hexadecaldehyde	136.45	40.63	11.38	-
2,4-Dimethylbenzaldehyde	-	-	238.93	Sweetness
Hexyl cinnamal	18.53	-	1.91	A lasting jasmine scent, with hints of gardenia and herbal aromas.
3,5-Di-tert-butyl-4-hydroxybenzaldehyde	43.74	48.56	-	-
3-Hydroxy-4-methoxybenzaldehyde	13.92	-	-	-
Fourteen aldehyde	13.23	-	-	A strong peach aroma
<b>Esters</b>				
Methyl isobutyrate	-	2.97	1.44	Features apple and pineapple fruit aromas, with an

				almond-like flavor
Methyl thioacetate	-	-	0.57	The aroma of eggs and ripe vegetables, with a hint of sulfur.
Methyl phenylacetate	-	-	5.82	A honey-like sweetness with a slight musky aroma
Methyl salicylate	85.72	9.77	27.05	Features a wintergreen herbal aroma, with a sweet and spicy taste
2,2,4-Trimethyl-1,3-Pentanediol Diisobutyrate	55.28	70.57	30.09	-
Diisobutyl adipate	25.55	-	-	-
Ethyl p-ethoxybenzoate	-	192.24	88.08	-
Methyl palmitate	38.12	23.5	26.97	-
Isopropyl palmitate	-	-	57.26	-
Tetranitrobenzoate	-	-	21.98	-
Methyl stearate	20.57	20.01	6.15	-
Ethyl stearate	-	-	3.82	Slightly waxy aroma
Homosalate	-	5.49	11.32	-
3-(3,5-Di-tert-butyl-4-hydroxyphenyl) propionate methyl ester	-	24.1	7.14	-
Diisobutyl phthalate	234.24	170.78	168.59	Fragrant aroma
Benzyl benzoate	-	16.08	6.43	A light, almond-like aroma with a faint floral scent
Dibutyl phthalate	363.99	87.73	70.99	A faint unpleasant smell
Octyl methoxycinnamate	-	107.62	-	-
<b>Alcohols</b>				
2,2,2-Ethylhexanol	242.52	-	-	Sweet taste, and slightly floral
2-(Base)-sunflower alcohol	3.08	155.72	-	-
Ortho benzyl alcohol	-	21.44	-	-
<b>Ketones</b>				

2,3-Pentanedione	-	-	53.01	Aromas of cream and caramel, with a nutty scent
2-Heptanone	-	-	9.57	A pear-like fruity aroma
Methyl heptane ketone	6.3	-	-	Fruity aroma with a fresh, clean scent
2-Nonanone	-	-	2.64	Features aromas of fruit, flowers, fats, and herbs
Acetophenone	-	-	89.65	Sweet taste and a scent similar to oranges
Benzylidene acetone	12.06	11.5	-	Pea aroma
Ortho aminoacetophenone	-	-	0.39	-
P-hydroxyacetophenone	-	52.67	-	-
3,5-Di-tert-butyl-4-hydroxyacetophenone	-	5.04	1.33	-
Benzophenone	-	54.08	-	A scent similar to roses
<b>Phenols</b>				
Phenol	31.65	58.19	40.17	Sour and burnt taste
4-Ethylphenol	198.78	-	-	A barnyard odor
2-Methoxy-4-ethylphenol	42.6	14.21	19.63	Features strong aromas of spices, cloves, and fermentation, with a scent of roasted peanuts
4-Methoxyphenol	-	-	2.77	-
2,4-Di-tert-butylphenol	224.11	218.94	83.62	Phenolic aroma
<b>Acids</b>				
Valeric acid	-	-	8.81	Buttery smell
1-Cyclopentene carboxylic acid	10.68	-	-	-
Nonanoic acid	253.56	109.72	186.72	Oleogustus
Caproic acid	-	-	26.68	An unpleasant dry coconut oil smell with a spicy taste
Benzoic acid	427.45	-	208.15	almond odor
Phenylacetic acid	38.37	-	18.69	Unpleasant smell
Lauric acid	162.99	64.65	98.27	Bay oil scent
Butyric acid	-	-	19.22	A strong, unpleasant aroma reminiscent of cream and

				cheese, with a creamy taste
Octanoic acid	-	-	326.94	A faint fruity acidity
<b>Pyrazines</b>				
3-Ethyl-2,5-methylpyrazine	-	594.17	-	Roasted nuts, cocoa flavor, and a potato taste
2-Methylpyrazine	-	44.42	63.68	Aroma similar to beef when heated, with nutty and cocoa-like scents
2,5-Dimethylpyrazine	45.16	171.21	192.02	Nutty, peanut, and roasted flavors.
2,6-Dimethylpyrazine	-	58.39	42.15	Roasted, coffee, peanut, and potato aromas
2-Ethyl-6-methylpyrazine	-	-	2.64	Features aromas of fruit, flowers, fats, and herbs
2,3,5-Trimethylpyrazine	-	60.9	26.38	Nutty, chocolate, coffee flavors
2-Vinylpyrazine	-	-	27.94	-
<b>Others</b>				
Dimethyl disulfide	116.09	-	-	Garlic aroma, strong onion scent
2-Pentylfuran	-	10.3	-	Bean aroma, fruit fragrance, earthiness, green aroma, and vegetable-like scent
Styrene	24.52	-	4.32	Aromatic scent, spicy aroma
D-terpendiene	-	-	58.21	A light floral scent, with flavors reminiscent of sweet orange and tangerine
1,2,4-Trimethylbenzene	-	4.46	16.79	Aromatic flavor
Dimethyl trisulfide	7.54	-	-	Sulfurous odor \ fishy odor \ cooked onion flavor
1,3-Dichlorobenzene	92.79	-	588.87	Aromatic flavor
Eucalyptus oleanol	25.13	6.57	-	Camphor scent and refreshing herbal flavor
Naphthalene	0.37	128.61	124.22	The scent of camphor wood, with a mild aromatic fragrance
Anethole	7.26	-	-	Similar to strong anise and hawthorn aromas
Ligustrazine	-	162.61	34.72	Aroma when beef and pork fat are heated, and the

2,3-Dihydro-1,1,3-trimethyl-1H-indene	-	-	43.43	fermented soybean flavor
Benzothiazole	73.98	391.1	194.63	- Meaty flavor, vegetable taste, coffee flavor, and nutty aroma
1-Methylnaphthalene	-	302.12	530.77	A scent similar to naphthalene

-, Not detected