Supplementary Materials

Table S1. Soluble proteins in different pretreatments that were identified to be present in significantly different levels.

Protein ID	Description	P Value[a]	Change[b]
A0A067XL60	Cold inducible RNA binding protein	0.0047	↓
G0XNX7	Peptidylprolyl isomerase	0.0476	↓
Q90YK7	Parvalbumin beta-2	0.0077	↓
Q90YK9	Parvalbumin beta	0.0072	↓
Q9W5Z6	Skeletal alpha-actin type-2	0.0164	↑
Q8QG69	Fast skeletal muscle troponin I	0.0011	↑
Q8JJ07	Fast skeletal muscle troponin T	0.0093	↑
A0A0E3XVM8	Creatine kinase	0.0141	↑
A0A0E3XUX0	Creatine kinase	0.0414	↑
Q98SS7	Creatine kinase	0.0020	↑
Q8AWX8	Glyceraldehyde-3-phosphate dehydrogenase	0.0009	↑
A7XA06	Creatine kinase	0.0051	↑
A8CZC9	Elongation factor 1-alpha	0.0034	↑
A0A0E3XVG5	Creatine kinase	0.0010	↑
Q5TJH5	L-lactate dehydrogenase	0.0205	↑

Notes: [a]$P<0.05$ were considered significant. [b]Upward and downward arrow indicates higher and lower level, respectively.

Table S2. Changes in free amino acid composition (ng/mg dw) of cod patties with or without pretreatment with *Allium* powders (n=3).

	CON	ON	CC	ML	WO	GA
Leucine	87.93 ± 0.60^C	84.70 ± 1.20^D	91.12 ± 0.86^B	109.31 ± 2.10^A	109.77 ± 1.83^A	90.22 ± 1.99^{BC}
Lysine	150.49 ± 21.66^B	117.80 ± 9.13^C	141.39 ± 9.65^B	111.26 ± 0.18^C	85.14 ± 9.26^D	227.23 ± 9.84^A
Isoleucine	58.09 ± 2.69^{CD}	54.06 ± 0.30^D	63.98 ± 2.15^B	71.56 ± 4.58^A	70.00 ±1.85^A	60.68 ± 0.40^{BC}
Valine	92.27 ± 7.61^D	84.61 ± 2.35^D	106.97± 4.74^B	115.89 ± 3.44^{AB}	118.45 ± 5.92^A	103.40 ± 4.90^C
Threonine	105.84 ± 2.28^D	102.81 ± 2.41^D	129.33 ± 1.68^B	132.71 ± 0.40^{AB}	136.05 ± 7.03^A	113.74 ± 2.96^C
Phenylalanine	43.34 ± 2.30^D	49.00 ± 0.69^C	52.38 ± 3.32^C	63.41 ± 3.55^B	68.54 ± 3.21^A	60.37 ± 2.94^B
Methionine	93.10 ± 2.98^A	74.15 ± 1.81^B	74.52 ± 2.80^B	76.49 ± 3.06^B	77.21 ± 6.97^B	93.00 ± 6.27^A
Tryptophan	5.85 ± 0.24^D	10.64 ± 0.53^B	10.58 ± 0.19^B	12.83 ± 0.32^A	13.43 ± 0.34^A	8.24 ± 0.73^C
∑EAA	636.90 ± 21.13^D	577.78 ± 10.98^E	670.27 ± 10.08^C	693.45 ± 4.55^B	678.60 ± 0.93^{BC}	756.88 ± 13.43^A
Tyrosine	34.36 ± 2.53^D	47.70 ± 3.86^A	45.66 ± 4.67^{AB}	38.42 ± 0.91^{CD}	39.71 ± 1.57^{BCD}	40.99 ± 4.76^{BC}
Cysteine	4.31 ± 0.50^C	4.06 ± 0.14^C	4.65 ± 0.52^{BC}	5.44 ± 0.11^A	5.43 ± 0.45^A	5.08 ± 0.28^{AB}
Histidine	2.13 ± 0.31^B	4.26 ± 0.05^A	3.96 ± 0.33^A	2.18 ± 0.68^B	3.57 ± 0.42^A	2.66 ± 0.08^B
Glutamine	12.01 ± 0.68^F	49.18 ± 0.61^D	105.41 ± 3.79^C	141.95 ±2.91^B	166.86 ±1.70^A	24.18 ± 0.84^E
Glutamic acid	275.50 ±11.19^C	185.93 ± 9.61^E	322.54 ± 9.54^A	291.64 ± 9.52^{BC}	219.21 ± 3.47^D	296.60 ± 10.60^B
Asparagine	2.14 ± 0.10^E	12.17 ± 0.60^C	22.97 ± 1.49^A	12.87 ± 0.26^{BC}	14.12 ± 0.53^B	6.44 ± 0.62^D
Aspartic acid	176.73 ± 7.91^D	172.38 ± 16.96^D	259.36 ± 5.82^A	230.17 ± 1.81^B	239.84 ± 12.34^B	207.70 ± 3.20^C
Arginine	39.85 ± 4.26^D	178.97 ± 12.08^B	50.17 ± 0.26^{CD}	61.68 ± 5.11^C	64.02 ± 0.63^C	957.55 ± 24.27^A
Alanine	633.66 ± 28.37^C	538.10 ±21.32^D	669.76 ± 7.92^{BC}	692.70 ± 19.66^{AB}	666.14 ± 25.46^{BC}	711.49 ± 22.17^A
Glycine	526.63 ± 28.98^A	376.32 ± 23.23^B	482.09 ± 37.43^A	489.85 ± 36.20^A	405.80 ± 19.60^B	514.04 ± 15.89^A
Serine	101.42 ± 2.08^D	102.67 ± 3.73^{CD}	156.37 ± 6.64^B	156.18 ± 4.66^B	166.13 ± 1.91^A	109.77± 4.21^C
Proline	64.54 ± 1.38^D	67.67 ± 0.76^{CD}	128.30 ± 6.79^A	73.36 ± 2.68^{BC}	75.82 ± 1.13^B	128.33 ± 3.31^A

CON: Control; ON: Onion-pretreatment; CC: Chinese chive-pretreatment; ML: Mongolian leek-pretreatment; WO: Welsh onion-pretreatment; GA: Garlic-pretreatment; dw: dry weight. $^{A-E}$ Values are expressed as mean ± standard deviation (SD) (n=3). Means in the same row with different letters were significantly different (*P<0.05*).

Table S3. Taste attributes, taste thresholds (ng/mg), and taste activity values (TAVs) of taste compounds in cod patties with or without pretreatment with *Allium* powders.

Taste compound	Taste attribute [a]	Taste threshold	CON [b]	ON	CC	ML	WO	GA
Glutamic acid	Umami (+)	100	2.76 ± 0.11^C	1.86 ± 0.10^E	3.23 ± 0.10^A	2.92 ± 0.10^{BC}	2.19 ± 0.03^D	2.97 ± 0.11^B
Aspartic acid	Umami (+)	30	5.89 ± 0.26^D	5.75 ± 0.57^D	8.65 ± 0.19^A	7.67 ± 0.06^B	7.99 ± 0.41^B	6.92 ± 0.11^C
Serine	Sweet (+)	150	0.68 ± 0.01^D	0.68 ± 0.02^{CD}	1.04 ± 0.04^B	1.04 ± 0.03^B	1.10 ± 0.01^A	0.73 ± 0.03^C
Glycine	Sweet (+)	130	4.05 ± 0.22^A	2.89 ± 0.18^B	3.71 ± 0.29^A	3.77 ± 0.28^A	3.12 ± 0.15^B	3.95 ± 0.12^A
Threonine	Sweet (+)	260	0.41 ± 0.01^D	0.40 ± 0.01^D	0.50 ± 0.01^B	0.51 ± 0.002^{AB}	0.52 ± 0.03^A	0.44 ± 0.01^C
Alanine	Sweet (+)	60	10.56 ± 0.47^C	8.97 ± 0.36^D	11.16 ± 0.13^{BC}	11.54 ± 0.33^{AB}	11.10 ± 0.42^{ABC}	11.86 ± 0.37^A
Proline	Sweet (+)	300	0.22 ± 0.005^D	0.23 ± 0.01^{CD}	0.43 ± 0.02^A	0.24 ± 0.01^B	0.25 ± 0.004^{CB}	0.43 ± 0.01^A
Histidine	Bitter (-)	20	0.11 ± 0.02^B	0.21 ± 0.003^A	0.20 ± 0.02^A	0.11 ± 0.03^B	0.18 ± 0.02^A	0.13 ± 0.004^B
Arginine	Bitter (-)	50	0.80 ± 0.08^D	3.58 ± 0.24^B	1.00 ± 0.005^{CD}	1.23 ± 0.10^C	1.28 ± 0.01^C	19.15 ± 0.49^A
Methionine	Bitter (-)	30	3.10 ± 0.10^A	2.47 ± 0.06^B	2.48 ± 0.09^B	2.55 ± 0.10^B	2.57 ± 0.23^B	3.10 ± 0.21^A
Isoleucine	Bitter (-)	90	0.65 ± 0.03^{CD}	0.60 ± 0.003^D	0.71 ± 0.02^B	0.80 ± 0.05^A	0.78 ± 0.02^A	0.67 ± 0.004^{BC}
Leucine	Bitter (-)	190	0.46 ± 0.003^C	0.45 ± 0.006^D	0.48 ± 0.005^B	0.58 ± 0.01^A	0.58 ± 0.01^A	0.47 ± 0.01^{BC}
Phenylalanine	Bitter (-)	90	0.48 ± 0.03^D	0.54 ± 0.01^C	0.58 ± 0.04^C	0.70 ± 0.04^B	0.76 ± 0.04^A	0.67 ± 0.03^B
Valine	Bitter (-)	40	2.31 ± 0.19^D	2.12 ± 0.06^D	2.67 ± 0.12^{BC}	2.90 ± 0.09^{AB}	2.96 ± 0.15^A	2.59 ± 0.12^{BC}
Lysine	Bitter (-)	50	3.01 ± 0.43^B	2.36 ± 0.18^C	2.83 ± 0.19^B	2.23 ± 0.003^C	1.70 ± 0.19^D	4.54 ± 0.20^A

[a] (+) = pleasant, (-) = unpleasant

[b] TAVs were calculated according to the taste threshold values of the free amino acids (taste compounds) and their concentrations in the roasted cod samples. CON: Control; ON: Onion-pretreatment; CC: Chinese chive-pretreatment; ML: Mongolian leek-pretreatment; WO: Welsh onion-pretreatment; GA: Garlic-pretreatment. [A-E] Values are expressed as mean ± standard deviation (SD) (n=3). Means in the same row with different letters were significantly different ($P<0.05$).