

Supplementary Material 1

Table 1a. Amino acid composition of hemp protein isolate (HPI) and hemp protein hydrolysates (HPH) obtained with Alcalase after 10, 20, 30, 45, and 60 min of hydrolysis. The data, expressed as milligrams of amino acids by grams of total protein, are the mean±standard deviation of three determinations.

Essential amino acids (mg/g prot)	HPI	HPH10A	HPH20A	HPH30A	HPH45A	HPH60A	2007 FAO/WHO/UNU a,b
Histidine	28.6 ± 0.2	25.8 ± 3.1	28.5 ± 0.1	28.8 ± 0.1	29.0 ± 0.1	28.6 ± 0.2	15
Isoleucine	23.8 ± 0.0	37.1 ± 4.3	41.0 ± 0.4	42.0 ± 0.1	41.9 ± 0.0	41.6 ± 0.1	30
Leucine	62.9 ± 0.4	55.9 ± 6.4	62.3 ± 0.5	64.6 ± 0.3	64.7 ± 0.4	64.4 ± 0.4	59
Lysine	29.2 ± 0.2	30.0 ± 3.4	33.1 ± 0.5	33.4 ± 0.3	33.7 ± 0.2	33.1 ± 0.1	45
Methionine + Cysteine	29.6 ± 6.6	13.5 ± 0.0	30.0 ± 0.3	26.4 ± 2.1	28.8 ± 3.0	30.0 ± 0.5	22
Methionine	17.9 ± 6.2	11.0 ± 0.0	24.2 ± 0.0	21.7 ± 1.5	23.6 ± 2.5	24.5 ± 0.2	16
Cysteine	11.7 ± 0.3	2.5 ± 0.0	5.8 ± 0.3	4.7 ± 0.6	5.2 ± 0.5	5.6 ± 0.3	6
Phenylalanine + Tyrosine	78.7 ± 0.7	68.1 ± 6.7	78.6 ± 0.7	80.7 ± 0.3	81.0 ± 0.5	80.7 ± 0.7	38
Threonine	34.1 ± 0.4	29.0 ± 3.3	32.1 ± 0.2	33.1 ± 0.1	32.9 ± 0.3	32.6 ± 0.2	23
Tryptophan	11.9 ± 0.2	9.7 ± 1.3	10.7 ± 0.0	11.0 ± 0.2	11.5 ± 0.5	11.7 ± 0.4	6
Valine	34.8 ± 1.1	39.8 ± 3.7	43.4 ± 0.5	45.8 ± 1.2	44.3 ± 1.1	43.0 ± 0.6	39
Total essential amino acids	363.2	322.5	389.5	392.3	396.5	395.8	277
Non-essential amino acids (mg/g prot)							
Aspartic acid	151.7 ± 0.8	142.3 ± 2.3	142.2 ± 2.3	142.2 ± 1.5	143.7 ± 0.9	143.4 ± 0.2	
Glutamic acid	194.2 ± 1.7	174.4 ± 16.5	191.9 ± 2.3	192.5 ± 0.2	193.2 ± 2.5	191.1 ± 1.6	
Serine	59.6 ± 0.4	45.2 ± 5.0	50.0 ± 0.4	50.9 ± 0.1	50.6 ± 0.7	49.7 ± 0.5	
Glycine	40.1 ± 0.2	32.9 ± 3.6	36.7 ± 0.4	37.4 ± 0.1	37.5 ± 0.2	37.1 ± 0.2	
Arginine	126.5 ± 0.9	119.7 ± 12.9	131.0 ± 1.2	131.4 ± 1.0	130.7 ± 1.1	129.2 ± 0.8	
Alanine	47.6 ± 0.4	39.3 ± 4.4	43.4 ± 0.5	44.3 ± 0.3	44.4 ± 0.3	44.1 ± 0.2	
Proline	58.6 ± 10.7	58.5 ± 8.7	45.4 ± 9.5	38.4 ± 1.1	37.0 ± 5.3	44.4 ± 0.0	
Total non-essential amino acids	678.2	612.3	640.5	637.1	637.1	639.0	

^a FAO/WHO/UNU. Protein requirement mg/g score pattern in adults. ^b FAO and FINUT 2017. Evaluation of the quality of dietary protein in human nutrition. FAO Food and Nutrition Document NO. 92.

Table 1b. Amino acid composition of hemp protein isolate (HPI) and hemp protein hydrolysates (HPH) obtained with Alcalase after 60 min and Flavourzyme after 15, 30, 60, 90, and 120 min of hydrolysis. The data, expressed as milligrams of amino acids by grams of total protein, are the mean±standard deviation of three determinations.

Essential amino acids (mg/ g prot)	HPI	HPH60A+					2007 FAO/WHO/UNU ^{a,b}
		15F	30F	60F	90F	120F	
Histidine	28.6 ± 0.2	27.7 ± 0.1	28.1 ± 0.8	27.2 ± 0.2	27.9 ± 0.8	28.7 ± 0.4	15
Isoleucine	23.8 ± 0.0	39.2 ± 0.7	40.0 ± 1.2	39.0 ± 0.2	40.0 ± 1.4	40.5 ± 0.8	30
Leucine	62.9 ± 0.4	64.6 ± 0.9	66.5 ± 1.7	64.3 ± 0.4	66.4 ± 2.1	67.1 ± 1.3	59
Lysine	29.2 ± 0.2	33.4 ± 0.4	34.4 ± 0.9	32.8 ± 0.2	34.3 ± 1.2	34.4 ± 0.7	45
Methionine + Cysteine	29.6 ± 6.6	25.0 ± 0.7	26.6 ± 3.1	18.0 ± 2.5	28.5 ± 1.9	31.3 ± 1.5	22
Methionine	17.9 ± 6.2	18.5 ± 0.4	19.6 ± 2.6	12.5 ± 2.1	21.1 ± 1.8	23.4 ± 1.2	16
Cysteine	11.7 ± 0.3	6.6 ± 0.3	7.0 ± 0.5	5.4 ± 0.4	7.4 ± 0.1	7.9 ± 0.3	6
Phenylalanine + Tyrosine	78.7 ± 0.7	80.3 ± 1.2	83.3 ± 2.5	80.0 ± 0.8	83.4 ± 2.5	85.2 ± 1.7	38
Threonine	34.1 ± 0.4	34.4 ± 0.5	35.7 ± 0.9	34.4 ± 0.3	35.5 ± 1.1	36.0 ± 0.6	23
Tryptophan	11.9 ± 0.2	11.1 ± 0.5	10.7 ± 0.0	12.2 ± 0.3	12.0 ± 0.0	12.1 ± 0.0	6
Valine	34.8 ± 1.1	42.6 ± 1.0	43.1 ± 0.8	44.0 ± 0.5	43.2 ± 0.9	43.7 ± 0.5	39
Total essential amino acids	363.2	383.3	395.1	369.9	399.6	410.3	277
Non-essential amino acids (mg/ g prot)							
Aspartic acid	151.7 ± 0.8	146.1 ± 1.7	150.0 ± 4.1	143.5 ± 1.2	150.2 ± 5.3	150.9 ± 2.9	
Glutamic acid	194.2 ± 1.7	189.8 ± 3.6	195.1 ± 4.0	189.4 ± 2.3	194.9 ± 6.2	195.7 ± 5.0	
Serine	59.6 ± 0.4	54.1 ± 0.8	55.9 ± 1.2	54.2 ± 0.6	55.8 ± 1.7	56.5 ± 0.9	
Glycine	40.1 ± 0.2	36.9 ± 1.0	39.3 ± 1.1	37.1 ± 0.3	38.4 ± 1.2	38.8 ± 0.7	
Arginine	126.5 ± 0.9	131.6 ± 1.6	134.3 ± 3.7	129.9 ± 0.8	134.5 ± 4.0	135.8 ± 2.4	
Alanine	47.6 ± 0.4	44.7 ± 1.0	46.5 ± 1.2	44.7 ± 0.3	46.6 ± 1.5	47.1 ± 1.0	
Proline	58.6 ± 10.7	28.8 ± 0.4	59.4 ± 1.6	57.2 ± 0.4	82.1 ± 1.5	63.3 ± 0.4	
Total non-essential amino acids	678.2	632.1	680.5	656.1	702.4	688.0	

^a FAO/WHO/UNU. Protein requirement mg/g score pattern in adults. ^b FAO and FINUT 2017. Evaluation of the quality of dietary protein in human nutrition. FAO Food and Nutrition Document NO. 92.