Woodhead Publishing Series in Food Science, Technology and Nutrition

Proteins in Food Processing

Second Edition

Edited by

Rickey Y. Yada





Contents

Lis Pre	List of contributors Preface		
1	Prop	Properties of proteins in food systems: An introduction	
	<i>E.C.</i>	Y. Li-Chan, I.M.E. Lacroix	
	1.1	Introduction	1
	1.2	Structural properties of proteins	3
	1.3	Factors affecting properties of proteins in food systems	12
	1.4	Future trends	18
	1.5	Sources of useful information	20
		References	20
2	Impa	act of processing on the chemistry and functionality of	
	food	proteins	27
	A.N.	A. Aryee, D. Agyei, C.C. Udenigwe	
	2.1	Introduction	27
	2.2	Structure and chemistry of food proteins	28
	2.3	Functionality of food protein	30
	2.4	Effect of processing on food protein functionality	34
	2.5	Effect of process-induced protein modifications on chemosensory	
		properties of food	40
	2.6	Conclusion	42
		References	42
		Further reading	45
Pa	rt On	e Sources of proteins	47
3	The	caseins: Structure, stability, and functionality	49
	T. Hı	uppertz, P.F. Fox, A.L. Kelly	
	3.1	Introduction	49
	3.2	Chemistry of caseins	50
	3.3	Casein interactions	62
	3.4	Casein-mineral interactions	64
	3.5	Casein micelles	65
	3.6	Stability of casein micelles	69
	3.7	Casein-based ingredients	74

	3.8	Conclusions and future perspectives References	79 79	
4	Whe	Whey proteins		
	A. K	ilara, M.N. Vaghela		
	4.1	Introduction: What are whey proteins? Sources of whey (acid	, sweet) 93	
	4.2	Analytical methods for determining protein content	94	
	4.3	Structure of whey proteins	98	
	4.4	Functional properties of whey proteins	102	
	4.5	Improving functionality of whey proteins in foods:		
		Physical processes and enzymatic modification	109	
	4.6	Future trends	117	
		References	118	
		Further reading	126	
5	Mus	cle proteins	127	
	Y.L. 1	Xiong		
	5.1	Introduction	127	
	5.2	Structure of muscle proteins	127	
	5.3	Endogenous proteases	130	
	5.4	Muscle protein functionality	132	
	5.5	Prepared muscle proteins as functional ingredients	139	
	5.6	Future trends	143	
	5.7	Sources of further information	143	
		References	144	
6	Soy	Soy as a food ingredient14		
	<i>K</i> . <i>N</i>	ishinari, Y. Fang, T. Nagano, S. Guo, R. Wang		
	6.1	Introduction	149	
	6.2	Structure of soybean proteins	151	
	6.3	Gels and gelling of soy proteins	156	
	6.4	Emulsification of soy proteins	163	
	6.5	How to improve the functionality and processability	169	
	6.6	Applications	171	
	6.7	Conclusion	177	
		References	177	
		Further reading	184	
7	Proteins from oil-producing plants		187	
	3.D.	Arnijieia	107	
	7.1 7.2	Introduction Characteristics of oilsond protoins	107	
	1.2 7.2	Characteristics of offseed proteins	10/	
	1.3 7 4	Factors mining protein utilization	191	
	1.4 75	Extraction and use of eileged protein hydrolycotes for	190	
	1.5	health benefits	202	

	7.6	Technofunctional properties of proteins	204
	7.7	Techniques to improve functional properties	207
	7.8	Utilization of oilseed proteins	209
	7.9	Future of these proteins	210
		References	211
8	Cere	als proteins	223
	N. Gı	uerrieri, M. Cavaletto	
	8.1	Introduction	223
	8.2	Protein function in the seeds	225
	8.3	Protein classifications	229
	8.4	Gluten properties	232
	8.5	Cereals and pseudocereals proteins in food processing	235
	8.6	Future trends	238
		Acknowledgements	240
		References	240
		Further reading	244
9	Seaw	reed proteins	245
	J. Fle	eurence, M. Morançais, J. Dumay	
	9.1	Introduction: Seaweed and protein content of seaweed	245
	9.2	Composition of seaweed proteins	248
	9.3	Algal protein digestibility	250
	9.4	Uses of algal proteins in food	255
	9.5	Future trends	200
	9.6	Sources of further information and advice	258
		Kelerences	239
10	Insec	ets as an Alternative Protein Source	263
	Y. Ak.	htar, M.B. Isman	2(2
	10.1	Introduction	203
	10.2	History of entomophagy	200
	10.5	Aming agida	200
	10.4	Annino actus Diatary anargy and fat contant	200
	10.5	Impact on the environment	2/4
	10.0	Challenges	277
	10.7	Conclusion	200
	10.0	Acknowledgments	203
		References	203
		Further reading	283 287
11	Prote	eins in cultured beef	289
	<i>M.J.</i>	Post	_37
	11.1	Introduction—Why cultured beef?	289
	11.2	Technology	290

vii

	11.3	Optimizing the product	292
	11.4	Whole cuts of meat	294
	11.5	Road to product development	295
	11.6	Summary	296
		References	297
Pa	rt Two	Analyzing and modifying protein	299
12	Food	proteins for health and nutrition	301
	N. Sh	ang, S. Chaplot, J. Wu	
	12.1	Introduction	301
	12.2	Growing demand for protein and sustainability	302
	12.3	Protein intake	303
	12.4	Protein quality and its measurement	304
	12.5	Bioactivities of proteins	305
	12.6	Applications	321
	12.7	Safety and legal aspects of protein	323
	12.8	Summary	323
		Further reading	325 336
13	Facto	ors affecting enzyme activity in food processing	337
	<i>M.G.</i>	Scanlon, A.W. Henrich, J.R. Whitaker	
	13.1	Introduction	337
	13.2	Enzyme types	338
	13.3	Parameters affecting enzymatic activity	340
	13.4	Endogenous enzymes	349
	13.5	Exogenous enzymes	350
	13.6	Future trends	360
		Acknowledgments	361
		References	362
14	Detec	ction and deactivation of allergens in food	367
	<i>C.L.</i> (Okolie, A.N.A. Aryee, C.C. Udenigwe	
	14.1	Introduction	367
	14.2	Mechanism of food-induced allergic reaction	368
	14.3	Detection of food allergens	369
	14.4	Food processing and allergenicity	372
	14.5	Conclusion	381
		References	382
15	Food	protein-derived peptides: Production, isolation, and purification	389
	л. <i>Е. Г</i> 15-1	Introduction	320
	15.1	Protein sources	380
	15.2	Enzymatic hydrolysis of proteins: Basic concepts	306
	15.5	Pentide separation and isolation methods	400
	10.1	reprise separation and isolation methods	

	15.5	Purification protocols	403
	15.6	Structural identification and amino acid sequencing	404
	15.7	Current uses	404
	15.8	Future trends	405
		References	406
		Further reading	412
16	Modi	fying seeds to produce proteins	413
10	STE	Jäkkinen AM Nuutila A Ritala	715
	16.1	Introduction	413
	16.2	Methods used for seed modification	415
	16.3	Applications in seed modification	421
	16.5	Future trends	430
	16.1	Sources of further information and advice	431
	10.0	References	431
			101
Pa	rt Thi	ree Applications	443
17	Seafo	ad proteins	445
17	M A	Mazorra-Manzano IC Ramírez-Suárez	110
	IM	Mareno-Hernández R Pacheco-Aquilar	
	17.1	Introduction	445
	17.2	Nutritional aspects of seafood proteins	446
	17.3	Technological and functional aspects of seafood proteins	447
	17.4	Seafood processing and its impact on protein quality	450
	17.5	Seafood proteins as food ingredients	458
	17.6	Recovery of high-value proteins from seafood and its by-products	461
	17.7	Proteins used as markers of quality and authenticity in seafood	464
	17.8	Future trends	466
	1,10	References	467
18	Edib	e films and coatings from proteins	477
	A. Ch	iralt, C. González-Martínez, M. Vargas, L. Atarés	
	18.1	Introduction	477
	18.2	Proteins as film-forming agents	478
	18.3	Physical and chemical methods to improve properties of protein films	478
	18.4	Active protein films	489
	18.5	Final remarks	493
		Acknowledgment	493
		References	494
		Further reading	500
19	Prote	in gels	501
	C.D. Munialo, S.R. Euston, H.H.J. de Jongh		
	19.1	Introduction	501
	19.2	Protein sources	502

	19.3	Gel formation by proteins	504
	19.4	Proteins as gelling agent	505
	19.5	Mechanical properties of protein gels	506
	19.6	Gel properties	508
	19.7	Relation between gel morphology and macroscopic responses	514
	19.8	Comparison between plant and animal protein gels	515
	19.9	Future trends	516
	19.9.	1 Conclusion	516
		References	517
20	Heal	th-related functional value of dairy proteins and peptides	523
	B. Mi	ralles, B. Hernández-Ledesma, S. Fernández-Tomé,	
	L. An	nigo, I. Recio	
	20.1	Introduction	523
	20.2	Health benefits of dairy proteins and peptides on metabolic	
		syndrome	524
	20.3	Effects of dairy proteins and peptides on intestinal epithelium	536
	20.4	Other effects of dairy proteins and peptides	546
	20.5	Conclusions and future challenges	550
		References	552
21	The u	ise of immobilized enzymes to improve functionality	569
	N.S. 1	Hettiarachchy, D.J. Feliz, J.S. Edwards, R. Horax	
	21.1	General overview about enzymes and immobilized enzymes	569
	21.2	Enzyme immobilization methods: Descriptions, benefits,	
		and drawbacks	577
	21.3	Usage of immobilized enzymes in food production,	
		medicine, and other fields	581
	21.4	The use of immobilized enzymes either in producing proteins,	
		carbohydrates, or lipids; or utilizing proteins, carbohydrates,	
		or lipids as the matrix, support, or carrier	586
	21.5	Other important applications of immobilized enzymes	588
	21.6	The practice of cell immobilization	589
	21.7	Potential and developing applications of immobilized enzymes	590
		References	590
		Further reading	597
22	Impa	ct of proteins on food color	599
	P.L. Dawson, J.C. Acton		
	22.1	Introduction	599
	22.2	Role of proteins in color	606
	22.3	Improving protein functionality in color control	620
	22.4	Applications to maintain color quality	622
	22.5	Future trends	632
		References	632
		Further reading	638
Ind	ex		639