

Contents

<i>List of tables</i>	ix
<i>Preface</i>	xi
1 Plant defensive compounds and their molecular targets	1
1.1 <i>Introduction</i> 1	
1.2 <i>Organization and scope of the book</i> 2	
1.3 <i>Description of the tables</i> 3	
1.4 <i>Using the tables</i> 6	
1.5 <i>The structural diversity of plant defensive compounds</i> 6	
1.6 <i>Plant alkaloids</i> 8	
1.7 <i>Plant phenolics</i> 21	
1.8 <i>Plant terpenes</i> 33	
1.9 <i>Other plant compounds</i> 44	
2 Biochemistry – the chemistry of life	52
2.1 <i>Introduction – water-based life</i> 52	
2.2 <i>Protein structure</i> 53	
2.3 <i>Enzymes and ligand-binding proteins</i> 58	
2.4 <i>Metabolic strategies</i> 66	
2.5 <i>Inhibition of biochemical processes by plant defensive compounds</i> 85	
3 Neurotransmitter- and hormone-gated ion channels	86
3.1 <i>Introduction – electrical signalling in excitable cells</i> 86	
3.2 <i>Ionotropic neurotransmitter receptors – neurotransmitter-gated ion channels</i> 88	
3.3 <i>Structure and function of ionotropic receptors</i> 88	
4 Ion pumps, ligand- and voltage-gated ion channels	123
4.1 <i>Introduction</i> 123	
4.2 <i>Ion pumps</i> 123	
4.3 <i>Voltage-gated Na⁺ channels</i> 125	
4.4 <i>Ligand-regulated and voltage-gated K⁺ channels</i> 126	
4.5 <i>Voltage-gated Ca²⁺ channels</i> 126	

vi Contents

4.6	<i>Ligand-gated Ca²⁺ channels</i>	126	
4.7	<i>Chloride transport and voltage-regulated chloride channels</i>	127	
5	Plasma membrane G protein-coupled receptors		157
5.1	<i>Introduction – signalling via heterotrimeric G proteins</i>	157	
5.2	<i>Gprotein-coupled hormone and neurotransmitter receptors</i>	158	
5.3	<i>Hormones and neurotransmitters acting via G protein-coupled receptors</i>	159	
5.4	<i>Activation of specific G protein-coupled receptors</i>	160	
5.5	<i>Leucocyte- and inflammation-related G protein-linked receptors</i>	162	
5.6	<i>Other G protein-coupled receptors</i>	164	
6	Neurotransmitter transporters and converters		231
6.1	<i>Introduction</i>	231	
6.2	<i>Synthesis of neurotransmitters</i>	232	
6.3	<i>Release of neurotransmitters from synaptic vesicles</i>	233	
6.4	<i>Re-uptake of neurotransmitters into neurons and synaptic vesicles</i>	233	
6.5	<i>Neurotransmitter degradation</i>	233	
7	Cyclic nucleotide-, Ca²⁺- and nitric oxide-based signalling		253
7.1	<i>Introduction</i>	253	
7.2	<i>Ca²⁺- and calmodulin-dependent enzymes</i>	254	
7.3	<i>Adenylyl cyclase</i>	255	
7.4	<i>Membrane-bound and soluble guanylyl cyclases</i>	255	
7.5	<i>Nitric oxide synthesis</i>	256	
7.6	<i>Cyclic AMP- and cyclic GMP-dependent protein kinases</i>	257	
7.7	<i>Protein kinase homologues and phosphoprotein phosphatases</i>	257	
7.8	<i>Cyclic nucleotide phosphodiesterases</i>	258	
8	Signal-regulated protein kinases		295
8.1	<i>Introduction</i>	295	
8.2	<i>Cyclic AMP-dependent protein kinase</i>	296	
8.3	<i>Cyclic GMP-dependent protein kinase</i>	297	
8.4	<i>Protein kinase C</i>	298	
8.5	<i>Ca²⁺-calmodulin-dependent protein kinases</i>	298	
8.6	<i>AMP-dependent protein kinase</i>	299	
8.7	<i>Receptor tyrosine kinases</i>	300	
8.8	<i>Protein kinase B</i>	301	
8.9	<i>Cytokine activation of the JAK/STAT pathway</i>	302	
8.10	<i>Cell cycle control</i>	303	
8.11	<i>Receptor serine/threonine kinases</i>	303	
8.12	<i>Other protein kinases</i>	303	
8.13	<i>Phosphoprotein phosphatases</i>	304	

9 Gene expression, cell division and apoptosis	339
9.1 <i>Introduction</i> 339	
9.2 <i>Regulation of gene expression in prokaryotes</i> 339	
9.3 <i>Regulation of transcription in eukaryotes</i> 340	
9.4 <i>RNA processing and translation</i> 342	
9.5 <i>Control of translation</i> 342	
9.6 <i>Protein processing and post-translational modification</i> 343	
9.7 <i>Protein targeting</i> 343	
9.8 <i>Cell division and apoptosis</i> 344	
9.9 <i>HIV-1 infection and HIV-1 replication</i> 345	
9.10 <i>Plant compounds interfering with gene expression</i> 345	
10 Taste and smell perception, pheromones and semiochemicals	396
10.1 <i>Introduction</i> 396	
10.2 <i>Sweet taste receptors</i> 397	
10.3 <i>Bitter taste receptors</i> 397	
10.4 <i>Salty taste perception</i> 398	
10.5 <i>Sour taste perception</i> 398	
10.6 <i>Umami (glutamate taste perception)</i> 398	
10.7 <i>Odorant perception</i> 398	
10.8 <i>Animal pheromones and other animal bioactives produced by plants</i> 399	
10.9 <i>Other plant semiochemicals affecting animal behaviour</i> 399	
10.10 <i>Odoriferous animal metabolites of ingested plant compounds</i> 399	
11 Agonists and antagonists of cytosolic hormone receptors	452
11.1 <i>Introduction</i> 452	
11.2 <i>Steroid hormones</i> 452	
11.3 <i>Non-steroid cytosolic hormone receptor ligands</i> 453	
11.4 <i>Plant bioactives affecting cytosolic receptor-mediated signalling</i> 454	
12 Polynucleotides, polysaccharides, phospholipids and membranes	487
12.1 <i>Introduction</i> 487	
12.2 <i>Polynucleotides</i> 488	
12.3 <i>Polysaccharides and oligosaccharides</i> 489	
12.4 <i>Phospholipids and membranes</i> 490	
13 Inhibitors of digestion and metabolism	517
13.1 <i>Introduction</i> 517	
13.2 <i>Glycohydrolases</i> 517	
13.3 <i>Proteases</i> 518	
13.4 <i>Glycolysis and tricarboxylic acid cycle</i> 522	
13.5 <i>Mitochondrial electron transport and oxidative phosphorylation</i> 522	
13.6 <i>Gluconeogenesis</i> 523	
13.7 <i>Solute translocation</i> 524	

viii Contents

14 Anti-inflammatory, antioxidant and antidiabetic plant compounds	595
14.1 <i>Introduction</i>	595
14.2 <i>Adhesion and movement of inflammatory leucocytes</i>	596
14.3 <i>Chemokines</i>	596
14.4 <i>Phagocytosis</i>	597
14.5 <i>Kinins, cytokines, platelet activating factor and eicosanoids</i>	598
14.6 <i>Plant-derived anti-inflammatory compounds</i>	599
14.7 <i>Diabetes mellitus and plant antidiabetic compounds</i>	599
14.8 <i>Summary</i>	601
Appendix: structures of key parent and representative compounds	658
<i>Bibliography</i>	673
<i>Compound index</i>	678
<i>Plant genus index</i>	730
<i>Plant common names index</i>	751
<i>Subject index</i>	779
<i>Abbreviations</i>	838