

Contents

PREFACE

	<i>Part I Possibilities and Problems</i>	1
1	INTRODUCTION	2
	The place of chemistry in taxonomy and systematics	4
	Information from molecules	6
	Chemical characters, the taxonomic hierarchy and the plant kingdom	8
	Chemical evidence of phylogeny	14
	Correlations of chemotaxonomic characters	15
2	THE ORIGINS OF CHEMOTAXONOMY	16
3	CHEMOTAXONOMIC INVESTIGATION	24
	Stages in chemotaxonomic investigation	27
	(a) Taxonomic survey	27
	(b) Chemical techniques and pilot surveys	29
	(c) Full analysis of all material	32
	(d) Interpretation and comparison of data	32
	(e) Taxonomic changes	33
	(f) Phylogenetic interpretation	34

	<i>Part 2 The Sources of Evidence</i>	35
4	TAXONOMIC EVIDENCE FROM AMINO ACID DISTRIBUTION	36
	Variation in amino acid content	39
	Functions of non-protein amino acids	41
	Taxonomic value of amino acid studies	43
5	EVIDENCE FROM PHENOLICS AND BETALAINS	48
	Chemical structure of phenolics	48
	Simple phenols	50
	Flavonoid compounds	51
	Variation in phenolic content	55
	Functions of phenolic compounds	56
	Taxonomic value of phenolic studies	58
	Phenolics and evolution	61
	Betalains	64
	Conclusion	66
6	EVIDENCE FROM PLANT OILS, FATS AND WAXES	67
	Occurrence, variation and functions	70
	Taxonomic usefulness of lipids and waxes	71
7	EVIDENCE FROM CARBOHYDRATES	77
	Structural diversity of carbohydrates	78
	Variations and functions	80
	Systematic distribution of carbohydrates	81
	Conclusion	88
8	EVIDENCE FROM ALKALOIDS	90
	Structures of alkaloids	95
	Pyridine and piperidine alkaloids	95
	Isoquinoline alkaloids	96
	Tropane alkaloids	97
	Indole alkaloids	97
	Variation and function of alkaloids	97
	Alkaloid distribution and taxonomy	104

9	TAXONOMIC EVIDENCE FROM TERPENOIDS AND STEROIDS	107
	Structural diversity of terpenoids and steroids	110
	Biogenesis and variation of terpenoids	113
	Functional significance of terpenoid characters	115
	Terpenoids and steroids as taxonomic characters	119
10	TAXONOMIC USEFULNESS OF PROTEIN COMPARISONS	128
	Chemistry and analysis of proteins	130
	Sources of variation in proteins	137
	Variability and evolution of proteins	141
	Proteins in taxonomic investigations	145
11	SEROLOGY AND TAXONOMY	153
	Serological principles	156
	Serological techniques	158
	Preparation of antigens	158
	Preparation of antisera	160
	Combination of antigen and antibody	161
	Applications of serology in plant taxonomy	167
12	NUCLEOTIDE VARIATION AND PLANT TAXONOMY	178
	Chemistry and biology of nucleotides and nucleic acids	179
	Analysis and variation	184
	Taxonomic applications of DNA hybridization	191
	Evaluation of nucleotide evidence	198
	<i>Part 3 Applications</i>	201
13	THE CASE OF THE BACTERIA	202
	Taxonomic data from cell walls	205
	Enzyme and protein studies	209
	Serology and bacterial taxonomy	210
	Nucleic acid studies	212
	The history of <i>Erwinia</i>	213
	Conclusion	217

14	CHEMICAL EVIDENCE AND TAXONOMIC PROBLEMS	218
	The recognition of minor variants	220
	Chemistry and the study of hybridization	224
	Chemical evidence, delimitation and the attribution of rank	234
	The recognition of species	234
	Chemotaxonomy at tribal and generic levels	235
	Chemical evidence at family and order levels	240
	Chemical evidence in taximetrics	245
	Nomenclature of chemical variants	246
	Conclusion	248
15	MACROMOLECULES AND PHYLOGENY	249
	Phylogenetic terms and dimensions	253
	Chemical evidence of phylogenetic relationships	257
	Sequence analysis of proteins in phylogenetic research	261
	Construction of phylogenetic trees	262
	Conclusions from phylogenetic trees	266
	The relevance of sequence analyses	268
16	SOME CONCLUSIONS	273
	REFERENCES	278
	INDEX	302