

Contents

Preface	ix
Taxonomic overview	xi
1 Organs, Cells and Tissues	1
1.1 Organs	1
1.2 Cells	2
1.3 Cell Inclusions	5
1.4 Secretory Ducts and Laticifers	7
1.5 Transfer Cells	9
1.6 Tissues	9
1.6.1 Parenchyma	10
1.6.2 Aerenchyma	10
1.6.3 Collenchyma	10
1.6.4 Sclerenchyma	11
1.7 Epidermis	13
1.7.1 Stomata	13
1.7.2 Trichomes	15
1.8 Ground Tissue	17
1.9 Vascular Tissue	18
1.9.1 Xylem	18
1.9.2 Phloem	19
1.10 Meristems	21
1.10.1 Apical Meristems	21
1.10.2 Lateral Meristems	22

1.10.3	Meristemoids and Asymmetric Cell Division	22
2	Stem	23
2.1	Shoot Apex	23
2.2	Primary Stem Structure	24
2.3	Primary Vascular System	26
2.4	Nodal Vasculature	27
2.5	Vascular Cambium	29
2.6	Secondary Xylem	31
2.7	Secondary Phloem	35
2.8	Primary and Secondary Thickening Meristems	36
2.9	Periderm	40
3	Root	43
3.1	Primary Root Structure	43
3.2	Root Apex	43
3.3	Root Cap	45
3.4	Root Epidermis and Hypodermis	46
3.5	Root Cortex and Endodermis	48
3.6	Pericycle and Vascular Cylinder	49
3.7	Initiation of Lateral and Adventitious Roots	50
3.8	Secondary Growth in Roots	51
3.9	Roots Associated with Micro-Organisms	53
3.10	Haustoria of Parasitic Angiosperms	54
4	Leaf	57
4.1	Leaf Morphology and Anatomy	57
4.2	Leaf Development	60
4.3	Leaf Epidermis	61
4.3.1	Pavement Epidermal Cells	61
4.3.2	Stomata	62

4.3.3	Trichomes and Papillae	63
4.3.4	Cuticle and Wax	66
4.4	Extrafloral Nectaries	66
4.5	Mesophyll	68
4.6	Sclerenchyma and Idioblasts	69
4.7	Leaf Vasculature	70
4.8	Bundle Sheath and Kranz Anatomy	72
5	Flower	75
5.1	Floral Organs	75
5.2	Floral Vasculature	77
5.3	Perianth	79
5.4	Androecium	81
5.5	Pollen	84
5.6	Gynoecium	87
5.6.1	Stigma and Style	87
5.6.2	Ovary	89
5.7	Ovule	90
5.8	Embryo Sac	93
5.9	Pollen-Tube Growth	94
5.10	Floral Secretory Structures	96
6	Seed and fruit	99
6.1	Seed Coat	99
6.2	Pericarp	101
6.3	Grass Caryopsis	102
6.4	Endosperm	104
6.5	Perisperm	106
6.6	Embryo	107
6.7	Seedling	109
	Glossary	111
	References	128
	Index	139