

2683-0115

The Germination of Seeds

FOURTH EDITION

by

A. M. MAYER

Professor of Botany,

The Hebrew University of Jerusalem, Israel

and

A. POLJAKOFF-MAYBER

Professor of Botany,

The Hebrew University of Jerusalem, Israel



PERGAMON PRESS

OXFORD · NEW YORK · BEIJING · FRANKFURT
SÃO PAULO · SYDNEY · TOKYO · TORONTO

Contents

<i>Preface to the Fourth Edition</i>	vii
<i>Preface to the Third Edition</i>	viii
<i>Preface to the Second Edition</i>	ix
<i>Preface to the First Edition</i>	x

1. The development of the seed and the structure of seeds and seedlings	1
I. Seed development	1
II. Structure of the seed coat	3
III. Variability between seeds	5
IV. Accumulation of reserve materials	14
V. Seeds and seedlings	17
VI. Germination	19
2. Chemical composition of seeds	23
I. Carbohydrates	27
II. Lipids	29
III. Proteins	30
IV. Other components	33
3. Factors affecting germination	38
I. Viability and life span of seeds	38
II. External factors affecting germination	44
1. Water	44
2. Gases	50
3. Temperature	52
4. Light	56
4. Dormancy, germination inhibition and stimulation	71
I. Secondary dormancy	73
II. Possible causes of dormancy	74
1. Permeability of seed coats	74
2. Temperature requirements	81
3. Light requirements and their interaction with temperature	86
4. Germination inhibitors	90
III. Germination stimulators	96
IV. Hormones in germination stimulation and inhibition	99
5. Metabolism of germinating seeds	111
I. Changes in storage products during germination	112
II. Metabolism of storage products	117
1. Carbohydrates	118

2. Lipids	122
3. Proteins	128
4. Metabolism of phosphorus-containing compounds	136
III. Metabolism of nucleic acids and proteins	141
1. Nucleic acid metabolism	142
2. Protein synthesis and its dependence on nucleic acids	145
IV. Respiration	151
1. Gaseous exchange	151
2. Biochemical aspects of respiration	157
6. Germination stimulators and inhibitors — their effects and their possible regulatory role	174
I. Effect of natural growth substances	174
1. Gibberellic acid	174
2. Cytokinins	179
3. Abscisic acid	180
4. Ethylene	185
5. The regulatory role of hormones	186
II. The effects of coumarin and thiourea	188
1. Effect on storage materials	188
2. Effect on respiration	191
3. Other effects	192
III. The effect of various metabolic inhibitors	195
7. The ecology of germination — the seed in its natural environment	201
I. Effect of the mother plant	203
II. Environmental factors in the habitat of the germinating seed	205
1. Water	205
2. Temperature	205
3. Gases	206
4. Light	206
5. Biotic factors	206
III. Ecological rôle of environmental factors	207
1. Moisture and temperature	207
2. Gases	212
3. Light	215
4. Soil conditions	220
5. Germination inhibitors	224
6. Biotic factors	225
7. Seedling establishment	230
8. Seeds and other methods of propagation and their use by man	237
I. Seeds as food	237
II. Seeds for propagation in agriculture	238
III. Somatic embryogenesis and organogenesis as a means of propagation	241
IV. Cryopreservation	243
<i>Plant index</i>	247
<i>Author index</i>	253
<i>Subject index</i>	265