

INDEX

INDEX OF ABBREVIATIONS	III
1 INTRODUCTION	1
2 PROLOG	2
2.1 Maintenance of plant genetic resources in <i>ex situ</i> gene banks	2
2.1.1 The importance to collect plant genetic resources	2
2.1.2 Long-term storage and utilization of <i>ex situ</i> collections	3
2.1.3 Wheat genetic resources	6
2.1.4 Barley genetic resources	7
2.1.5 Oil seed rape genetic resources	8
2.2 Survival in the dry state	9
2.3 The establishment of seed longevity during seed maturation	11
2.4 The physics of water and water activity in seeds	15
2.5 The glass formation as requirement for seed desiccation and storability	19
2.6 Seed viability loss during storage	21
2.6.1 Prediction and factors of seed viability loss	21
2.6.2 Biochemical mechanisms of seed viability loss	24
2.7 Seed protection mechanisms during quiescence	26
2.8 Aim of the study	31
3 SCIENTIFIC PUBLICATIONS	32
3.1 PAPER 1: The longevity of crop seeds stored under ambient conditions	32
3.2 PAPER 2: Machine learning links seed composition, glucosinolates and viability of oilseed rape after 31 years of long-term storage	45
3.3 PAPER 3: Changes in tocochromanols and glutathione reveal differences in the mechanisms of seed ageing under seedbank conditions and controlled deterioration in barley	55
3.4 PAPER 4: Wheat seed ageing viewed through the cellular redox environment and changes in pH	64
3.5 PAPER 5: Comparative physiology and proteomics of two wheat genotypes differing in seed storage tolerance	92

3.6	PAPER 6: Ageing is highly associated with lipid oxidation and hydrolysis in wheat seeds	102
3.7	PAPER 7: Barley seed ageing: genetics behind the dry elevated pressure of oxygen ageing and moist controlled deterioration.	124
3.8	PAPER 8: Seed longevity in oilseed rape (<i>Brassica napus</i> L.) - genetic variation and QTL mapping	136
3.9	PAPER 9: Genetic variation for secondary seed dormancy and seed longevity in a set of black-seeded European winter oilseed rape cultivars	141
3.10	PAPER 10: QTL analysis of falling number and seed longevity in wheat (<i>Triticum aestivum</i> L.)	148
3.11	PAPER 11: Effects of <i>Rht</i> dwarfing alleles on wheat seed vigour after controlled deterioration	157
3.12	PAPER 12: Genetic architecture of seed longevity in bread wheat (<i>Triticum aestivum</i> L.)	166
3.13	PAPER 13: Novel loci and a role for nitric oxide for seed dormancy and pre-harvest sprouting in barley	176
4	EPILOG	165
4.1	Seed deterioration processes are determined by the storage conditions	165
4.2	Differences in seed longevity are the consequence of compositional variations	170
4.3	Maternal growth environment influences seed longevity and seed dormancy	174
4.4	Molecular markers for seed deterioration at different water contents	176
4.5	The implications for gene bank management	180
5	SUMMARY AND CONCLUSIONS	182
6	REFERENCES OF PROLOG AND EPILOG	184
	ACKNOWLEDGEMENTS	196
	CURRICULUM VITAE	197