

Table of contents

1. Introduction and objectives	11
Aging in biological systems	11
Physical factors affecting longevity	12
Seed longevity	15
The Arabidopsis seed - Structure and development	18
Embryo molecular mechanisms promoting seed longevity	22
Maturation and seed desiccation tolerance	22
ROS-damage control	24
Embryo repair mechanisms	28
Seed coat protects the seed embryo	29
Transcription factors determine seed coat	29
Seed coat lipid polyester barriers	31
Environmental adaptation of seed longevity	42
How to study the seed longevity trait	46
Genomic molecular techniques	47
Objectives	50
2. Chapters	51
Chapter 1	53
<i>Plant, Cell and Environment (2020) 43:2523–2539</i>	DOI: 10.1111/pce.13822
Identification of novel seed longevity genes related to oxidative stress and seed coat by genome-wide association studies and reverse genetics	
Introduction	54
Results	56
Discussion	74
Chapter 2	81
<i>Submitted to New Phytologist</i>	
Apoplastic lipid barriers regulated by conserved homeobox transcription factors extend seed longevity in multiple plant species	
Introduction	82
Results	84
Discussion	107

Chapter 3 113

Plant, Cell and Environment (2020) 43:315–326

DOI: 10.1111/pce.13656

PRX2 and PRX25, peroxidases regulated by COG1, are involved in seed longevity in Arabidopsis

Introduction	114
Results	115
Discussion	125

Chapter 4 129

Work in progress and unpublished data

Environmental regulation of seed longevity is mediated by AtHB25 and COG1 through temperature and light cues

Introduction	130
Results	132
Discussion	149

3. General discussion 155

Validation of seed aging methods with Arabidopsis	155
New embryo genes important for seed longevity	156
Seed coat permeability determines seed longevity	158
Seed coat lipid polyesters and seed longevity	161
Regulation of <i>AtHB25</i> and <i>COG1</i>	166
Seed longevity is an adaptive trait	169
Contribution of this thesis to global aging theories	170

4. Conclusions 173

5. Materials and Methods 175

6. References 209

7. Attachments 251

Supplemental data	251
Extended protocols	274
Seed RNA extraction	274
Chromatin Immunoprecipitation	276
Traducción divulgativa al Castellano	281
Agradecimientos	319