

TABLE OF CONTENTS

INTRODUCTION.....	31
--------------------------	-----------

Genomic Tools for the Enhancement of Vegetable Crops: A Case in Eggplant.....	1
--	----------

Abstract.....	2
---------------	---

Introduction.....	5
-------------------	---

Genome assemblies.....	7
------------------------	---

Transcriptomes and RNA-based studies.....	10
---	----

Mapping studies, experimental populations, and genotyping methods.....	16
--	----

Future direction for genetics and genomics tools for eggplant breeding.....	31
---	----

Introgressiomics: a new approach for using crop wild relatives in breeding for adaptation to climate change.....	37
---	-----------

Abstract.....	38
---------------	----

Introduction.....	41
-------------------	----

Crop wild relatives for broadening the genetic base of crops.....	44
---	----

The introgressiomics approach.....	49
------------------------------------	----

Identification of CWRs for introgressiomics.....	55
--	----

Interspecific hybridization and backcrossing.....	59
---	----

Development of introgressiomics populations.....	65
--	----

Genomic tools and new plant breeding techniques for introgressiomics.....	72
---	----

Moving the introgressed material into the breeding pipeline	75
Conclusions.....	77
OBJECTIVES	81
RESULTS	87

Chapter 1: Transcriptome analysis and molecular marker discovery in *Solanum incanum* and *S. aethiopicum*, two close relatives of the common eggplant (*Solanum melongena*) with interest for breeding 89

Abstract.....	90
Introduction.....	93
Materials and methods	98
Plant material	98
RNA extraction for Illumina sequencing.....	100
Sequence data analysis and De novo assembly	100
Structural and functional annotation.....	101
Mapping transcriptomes against eggplant genome.....	102
Molecular markers discovery	103
SNVs.....	103
SSRs.....	104
Results and Discussion	106
Illumina paired-end sequencing and EST assembly	106
Annotation of <i>S. incanum</i> and <i>S. aethiopicum</i> transcriptomes	113
Molecular markers discovery and validation.....	121

Single nucleotide variations (SNVs)	121
SSRs.....	127
Conclusions.....	132
Additional files	134

Chapter 2: Comparison of transcriptome-derived simple sequence repeat (SSR) and single nucleotide polymorphism (SNP) markers for genetic fingerprinting, diversity evaluation, and establishment of relationships in eggplants..... 139

Abstract.....	140
Introduction.....	142
Material and methods.....	146
Plant materials	146
DNA extraction.....	149
SSR genotyping	149
SNP genotyping	150
Data analyses	154
Results and discussion	155
Validation of the SSR and SNP markers for fingerprinting .	155
SSR and SNP diversity statistics	159
SSR and SNP-based genetic relationships.....	164
Cluster analyses	169
Conclusions.....	171

Chapter 3: Coding SNPs analysis highlights genetic relationships and evolution pattern in eggplant complexes 175

Abstract.....	176
Introduction.....	178
Material and methods.....	183
Plant materials	183
Library construction and sequencing.....	187
Sequence analysis	187
Genetic relationships analysis and population structure.....	188
Results and discussion	190
Sequencing and SNPs identification.....	190
Genetic relationships analysis and population structure.....	194
PCoA analyses	198
Within-groups PCoA analyses.....	204
Conclusions.....	208
Additional files	211

Chapter 4: Location of the chlorogenic acid biosynthesis pathway and polyphenol oxidase genes in a new interspecific anchored linkage map of eggplant..... 213

Abstract.....	214
Introduction.....	216
Material and methods.....	221
Plant materials	221

Development of the SMIBC genetic map.....	223
DNA extraction.....	223
COSII markers	223
SSR markers	224
AFLP markers.....	225
Sequence search for candidate genes and in silico comparison.....	225
Additional markers	227
Linkage analysis and map construction	227
Macro-syteny between SMIBC and other genetic linkage maps.....	227
Results.....	229
Genetic map construction	229
COSII analysis	231
SSRs analysis.....	232
AFLPs analysis	232
Mapping of CGA pathway genes	233
PAL (phenylalanine ammonia lyase).....	233
C4H (cinnamate 4-hydroxylase).....	234
4CL (4-hydroxycinnamoyl-CoA ligase).....	234
HCT (hydroxycinnamoyl-coA shikimate/quinate hydroxycinnamoyl transferase)	235
C3'H (p-coumaroyl ester 3'-hydroxylase)	236
HQT (hydroxycinnamoyl CoA quinate hydroxycinnamoyl transferase).....	236

Mapping of PPO genes	237
Mapping of other genes and traits of agronomic importance	251
Synteny and orthologous candidate genes with other maps .	254
Conclusion	264

Chapter 5: Development and genetic characterization of advanced backcross materials and an introgression line population of *Solanum incanum* in a *S. melongena* background..... 267

Abstract	268
Introduction.....	270
Materials and Methods.....	275
Plant material	275
Breeding scheme.....	278
DNA extraction.....	281
Genotyping methods	281
COSII marker analysis.....	283
SSR marker analysis	283
SNP marker analysis.....	284
GBS analysis.....	285
Positioning candidate genes for drought tolerance	286
Results.....	287
Development of the ABs and ILs	287
Candidate genes for drought tolerance	296
Discussion.....	298

GENERAL DISCUSSION	309
Genomic information available in the eggplant genepool	312
Molecular markers identification	314
Diversity evaluation and the establishment of relationships in eggplant genepool	316
Development of genetic and genomic tools using CWRs	320
Future perspectives	325
CONCLUSIONS	329
REFERENCES.....	335