

## Table of contents

Abstract	1
<b><u>General introduction</u></b>	<b>13</b>
Introduction: Sustainable chemistry and circular bioeconomy	15
The biorefinery concept for bioenergy and bioproducts generation	20
Renewable resources towards circular bio-based economy	24
Industrial biotechnology, biocatalysis and biomass conversion	28
Bio-based chemicals and polymers for sustainable development	31
References	39
<b><u>Justification, objectives and scope</u></b>	<b>49</b>
<b><u>Experimental work and results</u></b>	<b>55</b>
List of Publications	57
CHAPTER I- <i>In silico prospection of microorganisms to produce polyhydroxyalkanoate from whey: Caulobacter segnis DSM 29236 as a suitable industrial strain</i>	59
1.1. Background and aim	60
1.2. Materials and methods	62
1.3. Results and discussion	66
1.4. Conclusion	80
References	80
CHAPTER II- <i>Camelina oil as a promising substrate for mcl-PHA production in Pseudomonas sp. Cultures</i>	89
2.1 Background and aim	90
2.2 Materials and methods	92
2.3 Results and discussion	94
2.4 Conclusion	100
References	101

<hr/>	
CHAPTER III- <i>Improved Raoultella planticola strains for the production of 2,3-butanediol from glycerol</i>	105
3.1 Background and aim	106
3.2 Materials and methods	107
3.3 Results and discussion	111
3.4 Conclusion	117
References	118
CHAPTER IV- <i>Microbial production of 2,3-Butanediol from the organic fraction of municipal solid waste</i>	121
4.1 Background and aim	122
4.2 Materials and methods	123
4.3 Results and discussion	126
4.4 Conclusion	133
References	134
CHAPTER V- <i>Production of D-lactic acid by the fermentation of orange peel waste hydrolysate by lactic acid bacteria</i>	139
5.1 Background and aim	140
5.2 Materials and methods	142
5.3 Results and discussion	144
5.4 Conclusion	151
References	151
<b><u>Integrative discussion</u></b>	<b>157</b>
Renewable bioprocessing to bio-based chemicals and polymers	159
<i>Direct polyhydroxyalkanoates production from food byproducts</i>	161
<i>Improvement and upscaling of 2,3-butanediol production from bio-residues</i>	163
<i>Production of D-lactic acid with high enantiomeric excess using citrus waste</i>	164
Prospects for bioprocesses development using renewable resources	165
References	166
<b><u>Conclusions and future work</u></b>	<b>169</b>
Contributions	173
Index of abbreviations	175