

Content

CONTENT.....	I
1 ABSTRACT.....	1
2 ZUSAMMENFASSUNG.....	2
3 INTRODUCTION	3
3.1 Phosphorus – an essential element for cellular growth and regulation.....	3
3.2 Phosphate starvation responses of microorganisms.....	6
3.2.1 <i>Escherichia coli</i> and the two-component systems PhoBR and CreBC	6
3.2.2 <i>Bacillus subtilis</i> and the regulatory systems PhoPR, ResDE and Spo0A.....	8
3.2.3 <i>Mycobacterium</i> and the two-component systems PhoPR and SenX3-RegX3	11
3.2.4 <i>Streptomyces</i> and the two-component system PhoPR	13
3.3 Phosphate starvation responses of <i>Corynebacterium glutamicum</i>	14
3.3.1 The two-component regulatory system PhoSR	15
3.3.2 The two-component regulatory system SenX3-RegX3.....	16
3.4 Development of microbial metabolomics	17
3.4.1 Sample preparation.....	18
3.4.2 Metabolome analysis	19
3.5 Aims of this work.....	20
4 RESULTS.....	22
4.1 SenX3-RegX3 (CgtS4-CgtR4), an essential two-component regulatory system of <i>C. glutamicum</i> involved in the phosphate starvation response.....	24
4.2 A link between phosphate starvation and glycogen metabolism in <i>C. glutamicum</i> revealed by metabolomics	56
5 DISCUSSION	88
5.1 Genetic regulation of P_i starvation responses in <i>C. glutamicum</i>.....	88
5.1.1 Regulation of P _i -dependent genes by PhoRS and SenX3-RegX3	89

5.1.2	The essentiality of the <i>regX3</i> gene	92
5.1.3	Regulatory model of the phosphate starvation response of <i>C. glutamicum</i>	96
5.2	Cross-regulation of carbon metabolism and the P_i starvation response	96
5.2.1	Glycogen metabolism of <i>C. glutamicum</i> under P _i limitation.....	98
5.2.2	Glucose uptake under P _i limitation in <i>C. glutamicum</i>	100
6	REFERENCES	102
7	APPENDIX	111
7.1	Influence of the phosphate limitation on L-lysine producer, <i>C. glutamicum</i> DM1945....	111