Electronic Supplementary Material (ESI) for Green Chemistry.
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Supplementary information to

Methanol-based acetoin production by genetically engineered *Bacillus methanolicus*

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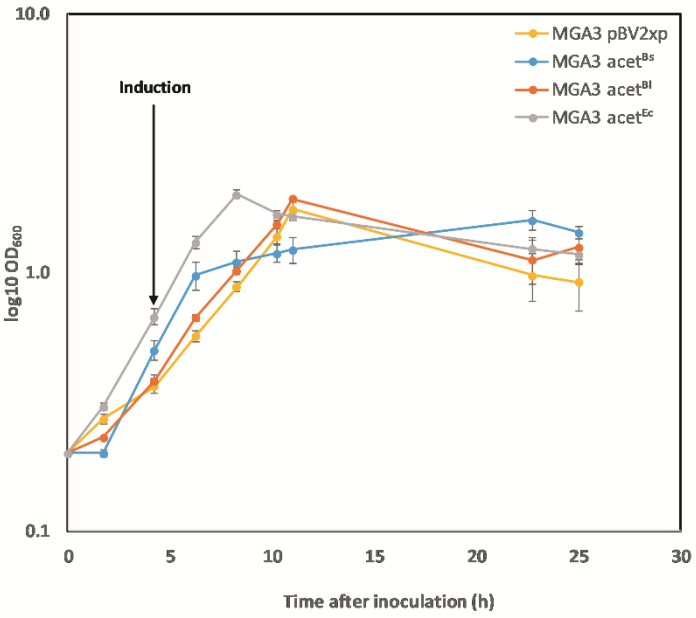

Figure S1 Biomass formation by MGA3 acetoin production strains. The strains were grown in minimal medium with 200 mM methanol and induced with 10 g/L of xylose added to the growth medium 4 hours after inoculation. The OD_{600} was measured every two hours for the first 9 hours, and 25 h after inoculation. The means of triplicates with standard deviations are shown.

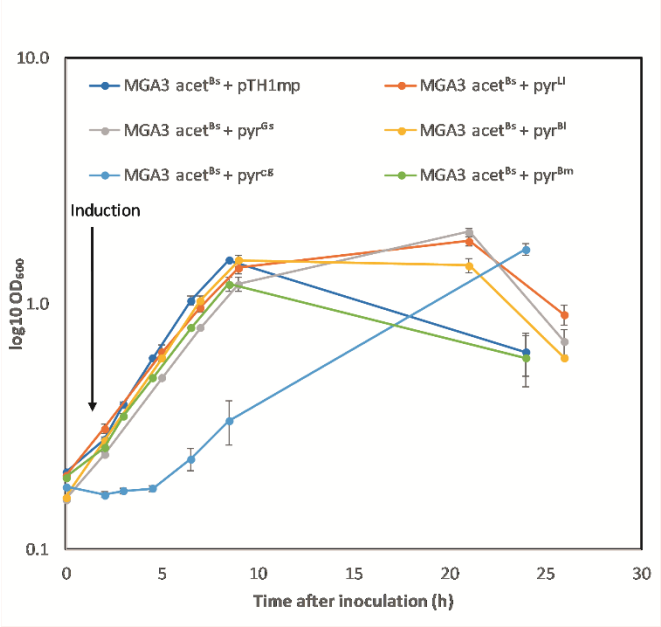

Figure S2 Biomass formation by *B. methanolicus* MGA3 $acet^{Bs}$ strains with a second plasmid overexpressing pyruvate replenishing genes. The strains were grown in minimal medium with 200 mM methanol and induced with 10 g/L of xylose added to the growth medium two hours after inoculation. The OD_{600} was measured every two hours for the first 10 hours, and 25 h after inoculation. The means of triplicates with standard deviations are shown.

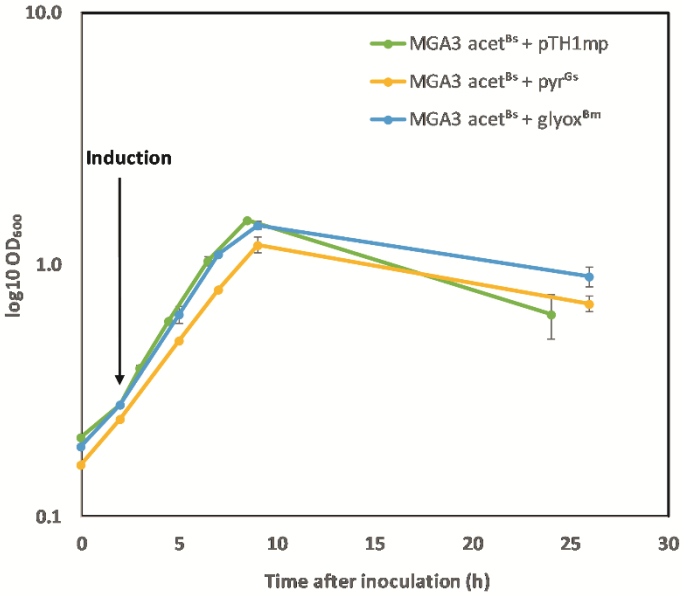

Figure S3 Biomass formation by MGA3 $acet^{Bs}$ strain with overexpressed genes coding for the glyoxylate shunt pathway compared to control strains. The strains were grown in minimal medium with 200 mM methanol and induced with 10 g/L of xylose added to the growth medium two hours after inoculation. The OD_{600} was measured every two hours for the first 10 hours, and 25 h after inoculation. The means of triplicates with standard deviations are shown.

Table S1. Primers used in this study.

Primer name	Sequence 5'→3'	Characteristics
alsSD B. subtilis FW	CTTAAGGGGGAAATGGCAAATGACAAAAGCAACAAAAGAACAAAAATC	Amplification of *alsSD* from *B. subtilis*
alsSD B. subtilis RV	ACGGCCAGTGAATTCGAGCTTTATTCAGGGCTTCCTTCAGTTGT	Amplification of *alsSD* from *B. subtilis*
alsSD B. licheniformis FW	CTTAAGGGGGAAATGGCAAATGAATAATGTAGCCGCTAAAAATGAAAC	Amplification of *alsSD* from *B. licheniformis*
alsSD B. licheniformis RV	ACGGCCAGTGAATTCGAGCTTTACTCGGGATTGCCTTCGG	Amplification of *alsSD* from *B. licheniformis*
budAB E. cloacae FW	CTTAAGGGGGAAATGGCAAATGATGCACTCATCTGCCTGCGA	Amplification of *budAB* from *E. cloacae*
budAB E. cloacae RV	ACGGCCAGTGAATTCGAGCTTCACAAAATCTGGCTGAGATGGA	Amplification of *budAB* from *E. cloacae*
AC01	TAAACAATTACATAAATAGGAGGTAGTACATATGCGTTTTGGACGAATTGCC ACCCCAGATGG	Amplification of *odx* from *C. glutamicum*
AC02	TAGACCTATGGCGGGTACCATATGTTAGGCGTCCACAACTGGGTTGCCCAGCT T	Amplification of *odx* from *C. glutamicum*
AC03	TAAACAATTACATAAATAGGAGGTAGTACATATGGTTGATTTTAATAAAGTT TTAGATTTACAC	Amplification of *citM from Lactococcus lactis* IL1403
AC04	TAGACCTATGGCGGGTACCATATGTTATTTTGCTGAATCTTTTACCGCTTTT	Amplification of *citM from Lactococcus lactis* IL1403
AC05	TAAACAATTACATAAATAGGAGGTAGTACATATGAACAACATGAGAAGAACG AAGGAAGGACATTT	Amplification of *mae* from *B. licheniformis*
AC06	TAGACCTATGGCGGGTACCATATGTTAGTCTTGTTTTGCAACAA	Amplification of *mae* from *B. licheniformis*
AC07	TAAACAATTACATAAATAGGAGGTAGTACATATGAATTCTGTTACGATTTCA AGCGAGTTG	Amplification if *pckA* from *B. methanolicus*
AC08	TTATGCGATAGGACCGCCTTTT	Amplification if *pckA* from *B. methanolicus*
AC09	AGGCGGTCCTATCGCATAAGTAAACAATTACATAAATAGGAGGTAGTAAGAA TGCGCAGAACAAAAATCG	Amplification if *pyk* from *B. methanolicus*
AC10	TAGACCTATGGCGGGTACCATATGTTATAATACGCTCGCATGAC	Amplification if *pyk* from *B. methanolicus*
AC11	TAAACAATTACATAAATAGGAGGTAGTACATATGGCATTACCAGGCGGGGCA GCCATGAACATTA	Amplification of *mae* from *G. stearothermophilus*
AC12	TAGACCTATGGCGGGTACCATATGTTACTGCCCTGTATATCCGCCAACCGGGA TATTG	Amplification of *mae* from *G. stearothermophilus*
AC13	CGCCATAGGTCTAGAGCTTGTAAACAATTACATAAATAGGAGGTAGTAAGAA TGACAGATTCTAGAGTACAACAATTA	Amplification of *aceA* from *B. methanolicus*
AC14	TGTAAAACGACGGCCAGTGAATTCTACTTTTCTTTTTTAAAAACGTTTTTGA	Amplification of *aceA* from *B. methanolicus*
MI09	GATACCAAATACTGTCCTTCTAGTGTAGCCG	Creation of pMI2mp vector
MI10	CGGCTACACTAGAAGGACAGTATTTGGTATC	Creation of pMI2mp vector
aceB_pBx_fw	TGATGGATAAACTTGTTCACAAGGAGGTAGTACATATGTCCACTCAAACGAC AGGC	Amplification of *aceBA* from *B methanolicus* for pBV2xp
aceA_pBx_rv	GTACGGATCCCATTTCCCCCTTAAGTTATTTTGCGGCGATAAATTGTTCTACT TCCG	Amplification of *aceBA* from *B methanolicus* for pBV2xp
aceB_pEC_fw	ATTCGAGCTCGGTACCCGGGGAAAGGAGGCCCTTCAGATGTCCACTCAAACGA CAGGC	Amplification of *aceBA* from *B methanolicus* for pEC-XT99A

aceA_pEC_rv	CCTGCAGGTCGACTCTAGAGTTATTTTGCGGCGATAAATTGTTCTACTTCCG	Amplification of *aceBA* from *B methanolicus* for pEC-XT99A
xp-pBV2_fw	CTGCCCCGGGGACGTCGACTCTAACTTATAGGGGTAACACTTAAAAAAGAAT CAATAACGA	Creation of pBV2xp vector
xp-pBV2_rv	TGAATTCGAGCTCATGGTACGGATCCCATTTCCCCCTTAAGTGAACAAGTTTA TCCATCAACTATCTTAATTGAGTTAGT	Creation of pBV2xp vector

Table S2. Plasmid backbones, promoters and gene sequences used in this study.

Sequence name	Used in plasmid	Nucleotide sequence	Annotation
pBV2xp backbone	pBV2xp pBV2xp-*alsSD*^{Bs} pBV2xp-*alsSD*^{Bl} pBV2xp-*budAB*^{Ec} pBV2xp-*aceBA*^{Bm}	GATCTGGAAAAACAAATCGAGTTGTTAAAGTTAAGAGCACAGTTTAAGAATAATGAAAAAAAGGACTGATCCTTGATTAAAAAGTTCAACTGTTCGATAATAGGATAGGTAGATGGACGAATATGACTATTTTTATTCCACAAAATGAGAGGAGATAGGTAAAATGCCCTATTCACCAACG CTTTTAGAAGGTGCTGTATCGGATATATTGCTACATAAAAAAATTCTTTCACCAAAAGATTTACGTCCAGAATTTCTGTCTAAAAGATTTGGGATTGAAATTATGACTGGAAAAACATCTTATGCTTACATTGACTCAGATGTTAAAGTGTTTGTTTTAGATAAAAAAGTTGAAGAAAAAG AGAGGAACTATCAATTCCATAAACTTTTTGCTCATACCTTGCTACATGAGGAAAATCATTTAGAGATACCCATGGAAGTATATGAAAAACATTCAGAAGAAGCAGAAAGGCTAACTTGGGTGGAAGCTATACCATATCATATGCTACGTTACATTGACTTTAGCGACCCTGAGTTTATAAAA CAAGCCTCAGATGTGTTTTATATTCCTGAAAAGGTTGTGCAAAACAGAATTAACTTTATGATACAACAACAATTTGAAATCGATGAATTTGATAATGTCAATGAAAAAGTAAAGAGTTTTGCTTAATCGCAAAGCTCTTTTTATTATTATCTTTTAAAAGCTTTTCTTAAAAGATTGTTTTC TTTGTCATTAAATTTTAATCCCTCCCCCATTAAGAAATTAATCAGTGTTATAACCCTAGTAAAAATTTTATTAGGGTCTTTTCTTGTGGATAAACCTCTAATTAAATTTTAATCCCCCCCTTGTTAAAATTTAATAGGGATTGAAATTAATATTTTGTATCCTCTTTATCCCTCATTAAATT TTAATTAGTCTACGTGTTAATTATTAATTCCAGTCTAAATAAATTTAAATCAGTACTCATTAAATATTGATACCTCCCTGATTATATTTTTTTCACTATTTCTAAATAAAAAAAACTGCTGAAATACTTCAGCAGTTTATTGCACTTTTCTTAGTTCGATTTTTTCGAAAACATATCCAGCTT CTTCAAGGACTGTTTTAATTGTTTCTAAATATCTTTTCTTAATCCATTCAAATGCAAATTCACTCGGTACAAGTAATAAACAATTTTTATTTTCAATTTTGATCTTAGTGTTTTTAAACCAGGTATCAAAAGAAGGCTTAGAGACACGATTTTGCATTTCGCTTTTTAAAGTACTGTCGACTT TTTCCTCTTCAGTTGTCATTGATATACTCTCAAAAGATGTTGTAGGATTAGGTATTTGTTTTTTGATTTCTTTTCGAATTTCTCCTTTACTGAGTATATCTTCATACATTGTGTCATATTGTAAGGCCTCTGGAATATTAATTGTTTCTGACTCATCCATCATTTTTTTAACAAATTCATCGT GCTCTTTTTTCAAAACCTTTGGAAGACCCTCTTTTTCCTTTTTTAAAGCCTTCTTTACATGTGCTTCCTCGTCATCTGGAATTTCAATATTAGGGTTTCCATTTAAAAGTTCTTCTGAAAGCAAAGGAACCTTACGTCTAATCTTAAAAATCGGGGATTCCTCTGTGTTATCCTTGGTTTTATT ACGGACGTTTACCTTCCAAATAAAACCGTACCTTTCAAGCAGTTTCAAGTAGCCTCTAACTGTAACAGGAGTCTTGTCCATTTTTTTAGCGATTGTTTGTAGACTAGGAAAGCAAAAGTCTTTGCTGCCGTATGCATAACGAGTTAGGTGAGCATAGAGCGCAATTCCTTCAGCACCTAAAAA ATAGCCCCAAAAATCAAAGAAGTAATTATTTAAGATTGTATAATGACCTTCTATGTAAGGTATATGCGTACCAAATTTGTCTAAAGAAAAGTTTTTTATTTGCTCTTCTGTCCATATCTTCTCTTCCGTTTCAGCAACATAATAAACTTCTTCTTTCCCTTTTTTGATTCTCTTCCTGGCGAT TTTATTTCCAGTGGTTTGCTGTCGATAATACACTAATTCATCTGTATTTCCTTTTAGGTTTACTTCACTCATAATGTCCCTCCGCGATCACCTAAAGGAACAGTGTAAAAGAGGATTTTCACTTGTATGGGGTTTAATAAAATGTTAAAATGGAGATAGTTAAATACAAGTATAAATCCGCC TTTTCCCCTTCTCAAATTTAACTTCTCAGTTTGGCCGCTGTTAGTTAAATTGAGATTCCGTTAGGTGGATTTTTTTTGTTTGTTTTTTCATCAAAAACAAACAGAGTTCTTCATATTCTGAAATAATCTTATCATATTTTTACTGGATTTAAAATATTTTTATTCCCATGTCTTTCTTAATTC TCTAATATATATTCAATGCTCCTAATATTTTTTTTAAAAAAACAGACTCGTTTGGAGTCTGTCTCAGCCTTTGTTGGTTCTTTTTTTTAATTCATATTCATAAAAAGTTTTTTGGCTCTCAGGTAATGTCTCAACCATCTTATCAATAGCTCTCTCAATAGTATCCTCTAAGTAATATGAATT 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CTAATATTATAACTAAATTTTCTAAAAAAAACATTGAAATAAACATTTATTTTGTATATGATGAGATAAAGTTAGTTTATTGGATAAACAAACTAACTCAATTAAGATAGTTGATGGATAAACTTGTTCACTTAAGGGGGAAATGGGATCCGTACCATGAGCTCGAATTCACTGGCCGTCG TTTTACAACGTCGTGACTGGGAAAACCCTGGCGTTACCCAACTTAATCGCCTTGCAGCACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGGCGCTAGAGCTTGGCACTGGCCGTCGTTTTACAACGTCG TGACTGGGAAAACCCTGGCGTTACCCAACTTAATCGCCTTGCAGCACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGGCGCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTCACACCGCA TATGTCAAAATGGTATGCGTTTTGACACATCCACTATATATCCGTGTCGTTCTGTCCACTCCTGAATCCCATTCCAGAAATTCTCTAGCGATTCCAGAAGTTTCTCAGAGTCGGAAAGTTGACCAGACATTACGAACTGGCACAGATGGTCATAACCTGAAGGAAGATCTGATTGCTTAACTG CTTCAGTTAAGACCGAAGCGCTCGTCGTATAACAGATGCGATGATGCAGACCAATCAACATGGCACCTGCCATTGCTACCTGTACAGTCAAGGATGGTAGAAATGTTGTCGGTCCTTGCACACGAATATTACGCCATTTGCCTGCATATTCAAACAGCTCTTCTACGATAAGGGCACAAATCG 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gene: *repA* (rev) Xylose repressor gene: *xylR* (rev) Xylose inducible promoter: PxylR (fwd) Ribosomal binding site: RBS (fwd) Kanamycin resistance gene: *kn*r (rev) Ampicillin resistance gene: *bla* (fwd) pUC origin of replication: pUC ori (rev)

pTH1mp backbone	pTH1mp pTH1mp-*mae*^{Gs} pTH1mp-*mae*^{Bl} pTH1mp-*odx*^{Cg} pTH1mp-*pckA-pyk*^{Bm} pTH1mp-*mae*^{Gs}-*aceA*^{Bm}	GTTCATTAAAGAGCAGCTGATGATGACTTTAATCCGTGTTCTTGTGCATAAGTTTGAGCAACAGCAACAAGGATTTTCTCTCGCTTATTTTCAAAAGATTAGTTAACTTAGTAGTAAAGCAATAAATCGAAGGAGGTTGTTTAATGTCTACGGAGTTAAAGCAAAAACCACAAAAAAAAGA ACCCCATCATGTTCAAAAGAGGCTTTATCAAAAATTTCTCAATCAATCGGTTGTCGTTCACTTAGTTTCCGGTTTAAAAGTAAAAGGAAAGCTGACCGAATATGATCAATACACTATTGCCGTTTCTGTCAAAAAAGAAGAAATGATGATCTATAAACACGCTATCAGCCTGATCCGTCCAT ACCATTCTGAGTCGGATGATGAATAAGAATGCTATCATTCTTTTATGGAAATATCGGATATAAAATTTAGAAAATTCATATATATTAAAAAAGACCTCCGATGATACAACAGCAGACGATCATGCAATAAACGGTTCCCTCAAAGAGGGATCAGTTAACCAAAGATGAGTAAATCCAGACCC TTAACGCTTACCGGCTCAAGGATGGATTTACTTTTTTTGTGTTTAACTTAAAAACGAGTGAACATCAATGCTTGAAAAACGGTCATAAACAGCGCTCTCTTTCGGGAATACTGACTACCGTTGAGTTTATCTATATCTATTGCCTATTCTATTACTCTTTTATTATATGAAAAAATAAAAACT 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TTCCCCGAACCATTATATTTCTCTACATCAGAAAGGTATAAATCATAAAACTCTTTGAAGTCATTCTTTACAGGAGTCCAAATACCAGAGAATGTTTTAGATACACCATCAAAAATTGTATAAAGTGGCTCTAACTTATCCCAATAACCTAACTCTCCGTCGCTATTGTAACCAGTTCTAAAA GCTGTATTTGAGTTTATCACCCTTGTCACTAAGAAAATAAATGCAGGGTAAAATTTATATCCTTCTTGTTTTATGTTTCGGTATAAAACACTAATATCAATTTCTGTGGTTATACTAAAAGTCGTTTGTTGGTTCAAATAATGATTAAATATCTCTTTTCTCTTCCAATTGTCTAAATCAAT TTTATTAAAGTTCATTGATATGCCTCCTAAATTTTTATCTAAAGTGAATTTAGGAGGCTTACTTGTCTGCTTTCTTCATTAGAATCAATCCTTTTTTAAAAGTCAATATTACTGTAACATAAATATATATTTTAAAAATATCCCACTTTATCCAATTTTCGTTTGTTGAACTAATGGGTGC TTTAGTTGAAGAATAAAAGACCACATTAAAAAATGTGGTCTTTTGTGTTTTTTTAAAGGATTTGAGCGTAGCGAAAAATCCTTTTCTTTCTTATCTTGATACTATATAGAAACAACATCATTTTTCAAAATTAGGTCAAAGCCTTGTGTATCAAGGGTTTGATGGTTCTTTGACAGGTAAAA ACTCCTTCTGCTATTATTAAGGTGTCGAATCAAAATAATAGAATGCTAGAGAACTAGCTCAGAAGGAGTTTTTTTGTTGATTTATTCATCTGAAAATGATTATAGCATCCTCGAAGATAAAACCGCAACAGGTAAAAAGCGGGATTGGAAGGGAAAAAGAGACGGACGAACCTCATGGCG GAGCATTACGAAGCGTTAGAGAGTAAGATTGGGGCACCTTACTATGGCAAAAAGGCTGAAAAACTAATTAGTTGTGCAGAGTATCTTTCGTTTAAGAGAGACCCGGAGACGGGCAAGTTAAAACTGTATCAAGCCCATTTTTGTAAAGTGAGGTTATGTCCGATGTGTGCGTGGCGCAGGTC GTTAAAAATTGCTTATCACAATAAGTTGATCGTAGAGGAAGCCAATAGACAGTACGGCTGCGGATGGATTTTTCTCACGCTGACGATTCGAAATGTAAAGGGAGAACGGCTGAAGCCACAAATTTCTGCGATGATGGAAGGCTTTAGGAAACTGTTCCAGTACAAAAAAGTAAAAACTTCGG TTCTTGGATTTTTCAGAGCTTTAGAGATTACCAAAAATCATGAAGAAGATACATATCATCCTCATTTTCATGTGTTGATACCAGTAAGGAAAAATTATTTTGGGAAAAACTATATTAAGCAGGCGGAGTGGACGAGCCTTTGGAAAAAGGCGATGAAATTGGATTACACTCCAATTGTCGAT ATTCGTCGAGTGAAAGGTAAAGCTAAGATTGACGCTGAACAGATTGAAAACGATGTGCGGAACGCAATGATGGAGCAAAAAGCTGTTCTCGAAATCTCTAAATATCCGGTTAAGGATACGGATGTTGTGCGCGGTAATAAGGTGACTGAAGACAATCTGAACACGGTGCTTTACTTGGATGA TGCGTTGGCAGCTCGAAGGTTAATTGGATACGGTGGCATTTTGAAGGAGATACATAAAGAGCTGAATCTTGGTGATGCGGAGGACGGCGATCTGGTCAAGATTGAGGAAGAAGATGACGAGGTTGCAAATGGTGCATTTGAGGTTATGGCTTATTGGCATCCTGGCATTAAAAATTACATA ATCAAATAAAAAAGCAGACCTTTAGAAGGCCTGCTTTTTTAACTAACCCATTTGTATTGTGTTGAAATATGTTTTGTATGGTGCACTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCA TCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTCAGAGGTTTTCACCGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTCTTAGCGATTCACAAAAAATAGGCACACGAAAAACAAGTTAAGG GATGCAGTTTATGCATCCCTTAACTTACTTATTAAATAATTTATAGCTATTGAAAAGAGATAAGAATTGTTCAAAGCTAATATTGTTTAAATCGTCAATTCCTGCATGTTTTAAGGAATTGTTAAATTGATTTTTTGTAAATATTTTCTTGTATTCTTTGTTAACCCATTTCATAACGAAAT AATTATACTTTTGTTTATCTTTGTGTGATATTCTTGATTTTTTTCTACTTAATCTGATAAGTGAGCTATTCACTTTAGGTTTAGGATGAAAATATTCTCTTGGAACCATACTTAATATAGAAATATCAACTTCTGCCATTAAAAGTAATGCCAATGAGCGTTTTGTATTTAATAATCTTTTA GCAAACCCGTATTCCACGATTAAATAAATCTCATTAGCTATACTATCAAAAACAATTTTGCGTATTATATCCGTACTTATGTTATAAGGTATATTACCATATATTTTATAGGATTGGTTTTTAGGAAATTTAAACTGCAATATATCCTTGTTTAAAACTTGGAAATTATCGTGATCAACAAG TTTATTTTCTGTAGTTTTGCATAATTTATGGTCTATTTCAATGGCAGTTACGAAATTACACCTCTTTACTAATTCAAGGGTAAAATGGCCTTTTCCTGAGCCGATTTCAAAGATATTATCATGTTCATTTAATCTTATATTTGTCATTATTTTATCTATATTATGTTTTGAAGTAATAAAGTT TTGACTGTGTTTTATATTTTTCTCGTTCATTATAACCCTCTTTAATTTGGTTATATGAATTTTGCTTATTAACGATTCATTATAACCACTTATTTTTTGTTTGGTTGATAATGAACTGTGCTGATTACAAAAATACTAAAAATGCCCATATTTTTTCCTCCTTATAAAATTAGTATAATTATA GCACGAAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATCCCTTAACGTGAGTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTCTTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAAACCACCGCTACCAGCGGTGG TTTGTTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACTGGCTTCAGCAGAGCGCAGATACCAAATACTGTTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAACTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTGGCGA TAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACTGAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACAG GTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAACGCCTGGTATCTTTATAGTCCTGTCGGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTGATGCTCGTCAGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTT CCTGGCCTTTTGCTGGCCTTTTGCTCACATGCATGTTCTTTCCTGCGTTATCCCCTGATTCTGTGGATAACCGTATTACCGCCTTTGAGTGAGCTGATACCGCTCGCCGCAGCCGAACGACCGAG CGCAGCGAGTCAGTGAGCGAGGAAGCGGAAGAGCGCCCAATACGCAAACCGCCTCTCCCC GCGCGTTGGCCGATTCATTAATGCAGCTGGCACGACAGGTTTCCCGACTGGAAAGCGGGCAGTGAGCGCAACGCAATTAATGTGAGTTAGCTCACTCATTAGGCACCCCAGGCTTTACACTTTATGCTTCCGGCTCGTATGTTGTGTGGAATTGTGAGCGGATAACAATTTCACACAGGAAAC AGCTATGACCATGATTACGCCAAGCTTGGCTGCA	Methanol dehydrogenase promoter: *Pmdh/mp* (fwd) Chloramphenicol resistance gene: *Cm-R* (rev) Origin of replication pTA1060: *ori pTA1060* Erythromycin resistance gene: *Em-R* (rev) Origin of replication pUC9: *ori pUC9*
pBV2mp backbone	pBV2mp	GATCTGGAAAAACAAATCGAGTTGTTAAAGTTAAGAGCACAGTTTAAGAATAATGAAAAAAAGGACTGATCCTTGATTAAAAAGTTCAACTGTTCGATAATAGGATAGGTAGATGGACGAATATGACTATTTTTATTCCACAAAATGAGAGGAGATAGGTAAAATGCCCTATTCACCAACG CTTTTAGAAGGTGCTGTATCGGATATATTGCTACATAAAAAAATTCTTTCACCAAAAGATTTACGTCCAGAATTTCTGTCTAAAAGATTTGGGATTGAAATTATGACTGGAAAAACATCTTATGCTTACATTGACTCAGATGTTAAAGTGTTTGTTTTAGATAAAAAAGTTGAAGAAAAAG AGAGGAACTATCAATTCCATAAACTTTTTGCTCATACCTTGCTACATGAGGAAAATCATTTAGAGATACCCATGGAAGTATATGAAAAACATTCAGAAGAAGCAGAAAGGCTAACTTGGGTGGAAGCTATACCATATCATATGCTACGTTACATTGACTTTAGCGACCCTGAGTTTATAAAA CAAGCCTCAGATGTGTTTTATATTCCTGAAAAGGTTGTGCAAAACAGAATTAACTTTATGATACAACAACAATTTGAAATCGATGAATTTGATAATGTCAATGAAAAAGTAAAGAGTTTTGCTTAATCGCAAAGCTCTTTTTATTATTATCTTTTAAAAGCTTTTCTTAAAAGATTGTTTTC TTTGTCATTAAATTTTAATCCCTCCCCCATTAAGAAATTAATCAGTGTTATAACCCTAGTAAAAATTTTATTAGGGTCTTTTCTTGTGGATAAACCTCTAATTAAATTTTAATCCCCCCCTTGTTAAAATTTAATAGGGATTGAAATTAATATTTTTGTATCCTCTTTATCCCTCATTAAATT TTAATTAGTCTACGTGTTAATTATTAATTCCAGTCTAAATAAATTTAAATCAGTACTCATTAAATATTGATACCTCCCTGATTATATTTTTTTCACTATTTCTAAATAAAAAAAACTGCTGAAATACTTCAGCAGTTTATTGCACTTTTCTTAGTTCGATTTTTTCGAAAACATATCCAGCTT CTTCAAGGACTGTTTTAATTGTTTCTAAATATCTTTTCTTAATCCATTCAAATGCAAATTCACTCGGTACAAGTAATAAACAATTTTTATTTTCAATTTTGATCTTAGTGTTTTTAAACCAGGTATCAAAAGAAGGCTTAGAGACACGATTTTGCATTTCGCTTTTTAAAGTACTGTCGACTT TTTCCTCTTCAGTTGTCATTGATATACTCTCAAAAGATGTTGTAGGATTAGGTATTTGTTTTTTGATTTCTTTTCGAATTTCTCCTTTACTGAGTATATCTTCATACATTGTGTCATATTGTAAGGCCTCTGGAATATTAATTGTTTCTGACTCATCCATCATTTTTTTAACAAATTCATCGT GCTCTTTTTTCAAAACCTTTGGAAGACCCTCTTTTTCCTTTTTTAAAGCCTTCTTTACATGTGCTTCCTCGTCATCTGGAATTTCAATATTAGGGTTTCCATTTAAAAGTTCTTCTGAAAGCAAAGGAACCTTACGTCTAATCTTAAAAATCGGGGATTCCTCTGTGTTATCCTTGGTTTTATT ACGGACGTTTACCTTCCAAATAAAACCGTACCTTTCAAGCAGTTTCAAGTAGCCTCTAACTGTAACAGGAGTCTTGTCCATTTTTTTAGCGATTGTTTGTAGACTAGGAAAGCAAAAGTCTTTGCTGCCGTATGCATAACGAGTTAGGTGAGCATAGAGCGCAATTCCTTCAGCACCTAAAAA ATAGCCCCAAAAATCAAAGAAGTAATTATTTAAGATTGTATAATGACCTTCTATGTAAGGTATATGCGTACCAAATTTGTCTAAAGAAAAGTTTTTTATTTGCTCTTCTGTCCATATCTTCTCTTCCGTTTCAGCAACATAATAAACTTCTTCTTTCCCTTTTTTGATTCTCTTCCTGGCGAT TTTATTTCCAGTGGTTTGCTGTCGATAATACACTAATTCATCTGTATTTCCTTTTAGGTTTACTTCACTCATAATGTCCCTCCGCGATCACCTAAAGGAACAGTGTAAAAGAGGATTTTCACTTGTATGGGGTTTAATAAAATGTTAAAATGGAGATAGTTAAATACAAGTATAAATCCGCC TTTTCCCCTTCTCAAATTTAACTTCTCAGTTTGGCCGCTGTTAGTTAAATTGAGATTCCGTTAGGTGGATTTTTTTTGTTTGTTTTTTCATCAAAAACAAACAGAGTTCTTCATATTCTGAAATAATCTTATCATATTTTTACTGGATTTAAAATATTTTTATTCCCATGTCTTTCTTAATTC TCTAATATATATTCAATGCTCCTAATATTTTTTTTAAAAAAACAGACTCGTTTGGAGTCTGTCTCAGCCTTTGTTGGTTCTTTTTTTTAATTCATATTCATAAAAAGTTTTTTGGCTCTCAGGTAATGTCTCAACCATCTTATCAATAGCTCTCTCAATAGTATCCTCTAAGTAATATGAATT CCCTTCGGATGCTGCCAGAATTTCGTGCAGCGATTTAATCTTATTATGGATTGAAACATCAACTTTCATTGTTTTCAACAATGCTTTTTTTCTTTTTGGTTCTGTTTGTTTAACCTCTGTTGTTTCTTTACTTTCAGAATCTGTAAGATCCATGTAAGGGTTCTTTAAGCTTGACCTATCGCCT TGTGGCTTTCTAGGTAGATCCCCTAATTTTCGTACCATTAACCTTCCACCCTTTCGATCAATTCCATTGTAAGGTTATTGAATAGTTTTAGAGCTTCTTTATCATGAGTATCTTCTTCCGTGATTCCTTGAACATCAAATCGCTTTATTCTTTCCCTTAATTTAATTGTGGAATTAAGCAAGTC ATCTCCAAATTCTTTCCGAGCTTCGTCCAAAATATACTGATCAACTGATCCACCTGATTTTATTAGTACAGGGACTATTCCTAATAAGCCGATATTAGCCTCGTATGTTTCAACCATTTGTTCCAGGTAAGGTATAAACTTTTCAGTTGCAGACAAAGATCTCCATGGACGCGTGACGTGAAA AAAGCCCGCTCATTAGGCGGGCTGCCCCGGGGACGTCGACTCTAGAGGATCCATGACTTTAATCCGTGTTCTTGTGCATAAGTTTGAGCAACAGCAACAAGGATTTTCTCTCGCTTATTTTCAAAAGATTAGTTAACTTAGTAGTAAAGCAATAAATCGAAGGAGGTTGTTTAATGTCTACGG	Plasmid replication gene: *repA* (rev) Methanol dehydrogenase promoter: *Pmdh/mp* (fwd) Kanamycin resistance gene: *knt* (rev) Ampicillin resistance gene: *bla* (fwd)

		AGTTAAAGCAAAAACCACAAAAAAAAGAAACCCCATCATGTTCAAAAGAGGCTTTATCAAAAATTTCTCAATCAATCGGTTGTCGTTCACTTAGTTTCCGGTTTAAAAGTAAAAGGAAAGCTGACCGAATATGATCAATACACTATTGCCGTTTCTGTCAAAAAAGAAGAAATGATGATCTAT AAACACGCTATCAGCCTGATCCGTCCATACCATTCTGAGTCGGATGATGAATAAGAATGCTATCATTCTTTTATGGAAATATCGGATATAAAATTTAGAAAATTCATATATATTTAAAAAAGACCTCCGATGATACAACAGCAGACGATCATGCAATAAACGGTTCCCTCAAAGAGGGATCAG TTAACCAAAGATGAGTAAATCCAGACCCTTAACGCTTACCGGCTCAAGGATGGATTTACTTTTTTGTGTTTAACTTAAAAACGAGTGAACATCAATGCTTGAAAAACGGTCATAAACAGCGCTCTCTTTCGGGAATACTGACTACCGTTGAGTTTATCTATATCTATTGCCTATTCTATTAC TCTTTTATTATATGAAAAATAAAAACTTCAAGTTGACCACAAAAAACTTTCATTTTTTAAGACAATTTGATGCCTTAGGATCTAGTCGATCAGTCGTTTTATGATATGACTTTAATCCTTTTTAAAGTCAAATTAAATACTGCCCTTCCACCTTAACCCTCCACACTATATAAGCGTCAAAA TCACTTTTCCTTTGGAAACCTTTTATTAGGCTGGTTTTTCCTTGAGCTTTTTATATAAAATTAATATTCAGATCCTTCTAATCCTTCTAAAAAATATAATTTAGAAAACTAAGAACATTACGACAACTATATTGACAAACATCCAGATTAGCATTTAAACTAGTTTTGTAAACAATTACATA AATAGGAGGTAGGTACCATGAGCTCGAATTCACTGGCCGTCGTTTTACAACGTCGTGACTGGGAAAACCCTGGCGTTACCCAACTTAATCGCCTTGCAGCACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGA ATGGCGCTAGAGCTTGGCACTGGCCGTCGTTTTACAACGTCGTGACTGGGAAAACCCTGGCGTTACCCAACTTAATCGCCTTGCAGCACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGGCGCCTGATG CGGTATTTTCTCCTTACGCATCTGTGCGGTATTTCACACCGCATATGTCAAAATGGTATGCGTTTTGACACATCCACTATATATCCGTGTCGTTCTGTCCACTCCTGAATCCCATTCCAGAAATTCTCTAGCGATTCCAGAAGTTTCTCAGAGTCGGAAAGTTGACCAGACATTACGAACTGGC ACAGATGGTCATAACCTGAAGGAAGATCTGATTGCTTAACTGCTTCAGTTAAGACCGAAGCGCTCGTCGTATAACAGATGCGATGATGCAGACCAATCAACATGGCACCTGCCATTGCTACCTGTACAGTCAAGGATGGTAGAAATGTTGTCGGTCCTTGCACACGAATATTACGCCATTTGC CTGCATATTCAAACAGCTCTTCTACGATAAGGGCACAAATCGCATCGTGGAACGTTTGGGCTTCTACCGATTTAGCAGTTTGATACACTTTCTCTAAGTATCCACCTGAATCATAAATCGGCAAAATAGAGAAAAATTGACCATGTGTAAGCGGCCAATCTGATTCCACCTGAGATGCATAAT CTAGTAGAATCTCTTCGCTATCAAAATTCACTTCCACCTTCCACTCACCGGTTGTCCATTCATGGCTGAACTCTGCTTCCTCTGTTGACATGACACACATCATCTCAATATCCGAATAGGGCCCATCAGTCTGACGACCAAGAGAGCCATAAACACCAATAGCCTTAACATCATCCCCATATTT ATCCAATATTCGTTCCTTAATTTCATGAACAATCTTCATTCTTTCTTCTCTAGTCATTATTATTGGTCCATTCACTATTCTCATTCCCTTTTCAGATAATTTTAGATTTGCTTTTCTAAATAAGAATATTTGGAGAGCACCGTTCTTATTCAGCTATTAATAACTCGTCTTCCTAAGCATCCTT CAATCCTTTTAATAACAATTATAGCATCTAATCTTCAACAAACTGGCCCGATGACTCTAGTTAAGGGTAACTAGCCTCGCCGATCCCGCAAGAGGCCCGGCAGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTTCTAAATACATTCAAATATGTATCCGCT CATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTGCGGCATTTTGCCTTCCTGTTTTTGCTCACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTTA CATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTCGCCCCGAAGAACGTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTCGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTACTCACC AGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACTCGCCTTGATCGTTGGGAACCGGA GCTGAATGAAGCCATACCAAACGACGAGCGTGACACCACGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAACTGGCGAACTACTTACTCTAGCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCGCTCGGCCCTTCCGGCTGGCTG GTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTCGCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACGACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACTGATTAAGCATTGGTAACT GTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAACTTCATTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATCCCTTAACGTGAGTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTCTTGAGATCCTTTTTT TCTGCGCGTAATCTGCTGCTTGCAAACAAAAAAACCACCGCTACCAGCGGTGGTTTGTTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACTGGCTTCAGCAGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAACTCTGTAGCACCG CCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTGGCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACTGAGATACCTAC AGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACAGGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAACGCCTGGTATCTTTATAGTCCTGTCGGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTGATGCTCGT CAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCCTGGCCTTTTGCTGGCCTTTTGCTCACATGTTCTTTCCTGCGTTATCCCCTGATTCTGTGGATAACCGTATTACCGCCTTTGAGTGAGCTGATACCGCTCGCCGCAGCCGAACGACCGAGCGCAGCGAGTC AGTGAGCGAGGAAGCGGAAGAGCGCCCAATACGCAAACCGCCTCTCCCCGCGCGTTGGCCGATTCATTAATGCAGCTGGCACGACAGGTTTCCCGACTGGAAAGCGGGCAGTGAGCGCAACGCAATTAATGTGAGTTAGCTCACTCATTAGGCACCCCAGGCTTTACACTTTATGCTTCCGGCT CGTATGTTGTGTGGAATTGTGAGCGGATAACAATTTCACACAGGAAACAGCTATGACCATGATTACGCCAAGCTTGCATGCCTGCAGGCCTCGA	pUC origin of replication: pUC ori (fwd)
pEC-XT99A backbone	pEC-XT99A-*aceBA*^{Bm}	GAATTCGAGCTCGGTACCCGGGGAAAGGAGGCCCTTCAGCTCTAGAGTCGACCTGCAGGCATGCAAGCTTGGCTGTTTTGGCGGATGAGAGAAGATTTTCAGCCTGATACAGATTAAATCAGAACGCAGAAGCGGTCTGATAAAACAGAATTTGCCTGGCGGCAGTAGCGCGGTGGTCCCACC TGACCCCATGCCGAACTCAGAAGTGAAACGCCGTAGCGCCGATGGTAGTGTGGGGTCTCCCCATGCGAGAGTAGGGAACTGCCAGGCATCAAATAAAACGAAAGGCTCAGTCGAAAGACTGGGCCTTTCGTTTTATCTGTTGTTTGTCGGTGAACGCTCTCCTGAGTAGGACAAATCCGCCGG GAGCGGATTTGAACGTTGCGAAGCAACGGCCCGGAGGGTGGCGGGCAGGACGCCCGCCATAAACTGCCAGGCATCAAATTAAGCAGAAGGCCATCCTGACGGATGGCCTTTTTGCGTTTCTACAAACTCTTTTTGTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGCTCCTTCG TCGGTGTCGTCGCCGGATGGTCTGCGGTGGTGCTCAGCGTGGAGACGCGCACCGTCACGGACCCCCATCAATCCTGCCTATTTGCCACGTTTAACAAGGTAGTTAAGCGTTCATTTACGAAGAAAACACGATAAGCTGCACAAATACCTGAAAAAGTTGAACGCCCCGTGAGCGGGAACTCAC AGGGCGTCGGCTAACCCCCAGTCATCAGCTGGGAGAAAGCACTCAAGACATGACTCTAGCCGATCCGCAGGACACAGTCACAGCTAGCGCGTGGAAATTGTCCGCCGATCTGTTCGACACCCACCCCGAAGCTATGCGCTGCGGCTCACGCGGCTGGACGGCAGAAGATCGCCGCGAACTGCTC GCTCACCTGGGACGCGAAAGCTTCCAGGGCAGCAAGACAAGAGATTTCGCGAGCGCCTGGATTAAAAACCCGGATACCGGCGAAACCCAACCAAAGCTCTACCGGGCTGGCTCAAAAGCGCTGACGCGGTGCCAGTACGTTGCGCTGACGCACGCGCAACATGCCGCGGTGATCGTGCTTGACA TCGATGTGCCCAGCCACCAGGCCGGCGGGAAGATTGAGCACGTAAACCCGCAGGTCTACGCGATTTTAGAGAAATGGGCACGCCTAGAAAAAGCGCCGGCTTGGATCGGCGTGAATCCGCTGAGCGGGAAATGCCAGCTCATCTGGCTCATTGACCCGGTGTATGCCGCAGCAGGTAAAACCA GCCCAAATATGCGCCTGCTGGCTGCAACGACGGAAGAAATGACTCGTGTTTTCGGCGCTGACCAGGCTTTTTCGCATAGGCTGAGCCGGTGGCCGCTGCACGTCTCAGACGATCCGACAGCCTATAAATGGCACTGCCAGCATGATCGTGTGGATCGGCTGGCCGACCTAATGGAGATTGCTCG AACGATGACCGGATCACAGAAGCCGAAAAAGTACATTGAGCAGGACTTTTCCAGCGGACGCGCCCGCATTGAAGCGGCACAACGCGCCACCGCAGAAGCCAAGGCGCTAGCGATTTTGGACGCGAGCCTGCCGAGCGCCCTGGACGCGTCCGGCGACCTGATCGACGGCGTGCGAGTGCTCTGG ACAAATCCAGAGCGAGCGCGCGACGAGACCGCGTTTCGCCACGCGTTGACCGTGGGATACCAGCTCAAAGCTGCTGGTGAGCGCCTAAAAGATGCCAAGATCATCGACGCGTATGAAGTGGCGTACAACGTTGCCCAGGCGGTCGGTGCAGACGGCCGGGAGCCGGATCTTCCCGCCATGCGTG ATCGCCTGACGATGGCGCGTCGTGTGCGCGGCTACGTGGCTAAAGGCCAGCCAGTCGTCCCTGCTCGTCGGGTGGAAACGCAGAGCAGCCGAGGGCGGAAAGCTCTAGCGACGATGGGGCGACGGGGCGCAGCTACATCGAATGCACGCAGATGGGCTGACCCAGAAAGTAAGTATGCGCAGG AGACGCGACAGCGATTAGCGGAAGCAAACAAACGCCGAGAAATGACAGGCGAGTTGCTCGAACTTCGCGTCAAAACTGCGATCCTGGATGCCCGTTCTCAATCGGTTGCTGATCCCTCGACTCGTGAGCTTGCAGGCGAACTAGGTGTCAGTGAAAGGCGCATCCAACAAGTCAGAAAGGCAC TTGGAATGGAAGCTAAACGCGGCCGTCCACGGGCTGAAAACTAATAAACGAAACACCGTCAGCAGAAAACGGTTCCCCCTTTAGGGGTCCCGTCCTTGCTCTGGCTCTCACTTGCCCTCACCCTCCGCTATCCACGGGCTGAAAACTAATAAACGAAACACCGTCAGCAGAAAACGGTTCCCC CCCTTTAGGGTGTCTCGCTCCTAGCTCTGATCCCTCCCCGGTTCCTCCCCGGCCTGATTTTTAAGGGGGCTCACGCTGTCGGCAGAGAACGGTTCCCCCGCCTTCTGCTCTGGCTCTTCCTCGACTCCCTCCCCCTCAAAAATCTCCTCGAGATCCTGGAGACCTTTTTGGAGCTAGCGCGTTGCT GCTTCGCACCAACTTGCTCATGATGATTTTCATTTTTGCTTGTGTGCTTTTTTGGGTTGAACCCTCCAAAGAGGGGAAACCAGGGGCACACCTCATGCACTAAAGTGCCGCTTCGCTGGTCAGGGTGAAATCACCTGGAAAAAAAGTGCGGTAACCGCTGCGCTTGGCGTTTTTCTGGGCAA GAAGTCTCGCAGGTTTCGCAGGAGTGCCGGAAGAAATTATCAGAATTGGGGCTAGAATTTTTAACGAACGTTCGTTATAATGGTGTCATGACCTTCACGACGAAGTACCAAAACTGGCCTGAAGCATCAGCGGTGGATCTCTCCGATGTCGCGCTGGAGTCCGACGCACTCGATGCCGCCGT CGATTTAAAAACGGTGATCGGATTTTCCGCGCCCTCGATACGACAGACGCGCCAGCATCACGCGACTGGGCAAGTGCCGCGAGCGACCTAGAAACGCTTGTGGCCGACCTTGAAGAGCTGGCCGACGAGCTGCGTGCTCGGCAGCGCCAGGAGGACGCGCAGTAGTGGAGGATCGCATCAGC TGCGCCTACTGCGGTGGCCTGATCCCACCCCGGCCTGACCCACGAGGACGGCGCGCAAAATACTGCTCAGACGCGTGTCGTGCCGCAGCCAGCCGCGAGCGCGCCAACAAGCGCCACGCCCAGGAGGTCGAAGCCGCACGTCGACCGCGTGTAGTGCGTGGCGGAAACTTCTTGCGTTTCGCAAG AGAAATGCGTCCCATTTCTCGTCGGACTCGGGGAAGGAAGCGTGATGCTCTCGGTCAAGCACGTCGCTCGCCAGCGCTGCGAGGAGTTCGGCCTTCGTGCGGAAGTGCCAGTAGAGGCCGGGCTGCTGTACCTGTAAGTGAGCCGCCAGCGCGCGAGTGGTGAAGCCATCGAGCCCAGTCTCGT CGAGCACCTGCCGGGCCCCGAGCAACACGGACGTGCGGTCGAGACGCTTCCGGTGGTGAGTCATAGTTGCACTTTATCATCGATAACTTTATCTTAGATAAAGTGACTGCTCGCTACTCTCATCTGACTGCTCGCTACTCTCATCGTGGAATCCTGACAGCCGTGCTCATCACGGCGACCCTCG ATGCTGCAGGGCTGGGCCTCGTGATGCCGATCTTGCCTACCCTTCTCGACCAGGTCGGTGCCCCCGACGACATGATCCCACTGCACGTCGGACTACTGACAGCGCTCTATGCGATCATGCAGTTTCTTTGCGCCCCGATCCTTGGCCGACTCTCTGACCGTTTCGGACGCCGCCGCGTGCTTGTC GCCTCCCTCGCAGGCGCGACGATCGACTACCTCGTGCTCGCACTGACGGACACGCTGTGGGTCTTTTACCTCGCCCGCGCGGTTGCAGGCATTACCGGCGCCACGAACGCCGTCACCGCGACGGTGATCGCCGACATTACTCCGCCGGATCAGCGCGCAAAACGCTACGGGTGGCTCGGCGCATG CTACGGCGGTGGCATGATCGCGGGTCCCGCCATTGGCGGTCTTTTCGGCGGGGTCTCACCGCATCTGCCATTCCTCGTCGCCGCCGCGCTCGCCGGAATCACCCTCGTACTCAGCGCGAGTCTTCTGCGTGAGACGCGGCCACCGGGCAGCAACGGCTCGCACGCACAGCAACCCGGTACGGCGA AGCGAACCGCAGTGCCGGGGATGCTTATCCTTCTCGCAGTCTTCGGCATCGTGCAGTTCATCGGCCAAGCACCAGGCTCCACCTGGGTGCTCTTCACGCAGCAGCGCCTCGACTGGAACCCCGTCGAAGTCGGCGTTTCGCTATCCATCTTCGGAATGGTGCAAGTATTCGTGCAGGCGGCACT GACCGGACGCATCGTGTCCGGATCGGCGAGACCCGGGCGATCCTCGTCGGTATCGCCGCAGACGCCATTGGGCTCATCGGCCTTGCCCTCATCGCCAGCACATGGGCGATGCTACCGATCCTCGCAGCGCTCGGACTCGGCAGCATCACGTTGCCCGCACTGCAGACGCTGCTCTCGAGACGCG CGCCCGAGCAGCAGCAGGGACGCCTGCAGGGAACACTTGCAAGCCTGAACAGCCTCACCTCGATCATCGGCCCGGTCACCTTCACCGGCATTTTCGCACTCACCCGAACGAATGCAGACGGCACCCTCTGGATCTGCGCCGCAGCGCTCTACGTTCTCTGCGCCCTCCTGATGATCCGTGAGACA	Plasmid replication gene: *rep* (fwd) Tetracycline resistance gene: *TetR* (fwd) Origin of replication: *ori* (fwd) lacIq promoter : lacIq promoter (fwd) lacI gene: *lacI* (fwd) trc promoter: trc promoter (fwd)

		TGCGCCTCACGGCGATCTCGATAACCGCGCTAAGGTGCCATCCCGATGCGACGGGATCGCTCTGCCACCAGTCAAGTCTCCCGTAGCCGGTATGAGCATGACCAAAATCCCTTAACGTGAGTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTCTTGAGATCCTTTT TTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAAACCACCGCTACCAGCGGTGGTTTGTTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACTGGCTTCAGCAGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAACTCTGTAGCAC CGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTGGCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACTGAGATACCT ACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACAGGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAACGCCTGGTATCTTTATAGTCCTGTCGGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTGATGCTC GTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCCTGGCCTTTTGCTGGCCTTTTGCTCACATGTTCTTTCCTGCGTTATCCCCTGATTCTGTGGATAACCGTATTACCGCCTTTGAGTGAGCTGATACCGCTCGCCGCAGCCGAACGACCGAGCGCAGCGAG TCAGTGAGCGAGGAAGCGGAAGAGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTCACACCGCATATGGTGCACTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGTATACACTCCGCTATCGCTACGTGACTGGGTCATGGCTGCGCCCCGACACCCGCCAAC ACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTCAGAGGTTTTCACCGTCATCACCGAAACGCGCGAGGCAGCAGATCAATTCGCGCGCGAAGGCGAAGCGGCATGCATTTACGTTGACACCATCGAATGGT GCAAAACCTTTCGCGGTATGGCATGATAGCGCCCGGAAGAGAGTCAATTCAGGGTGGTGAATGTGAAACCAGTAACGTTATACGATGTCGCAGAGTATGCCGGTGTCTCTTATCAGACCGTTTCCCGCGTGGTGAACCAGGCCAGCCACGTTTCTGCGAAAACGCGGGAAAAAGTGGAAGCGG CGATGGCGGAGCTGAATTACATTCCCAACCGCGTGGCACAACAACTGGCGGGCAAACAGTCGTTGCTGATTGGCGTTGCCACCTCCAGTCTGGCCCTGCACGCGCCGTCGCAAATTGTCGCGGCGATTAAATCTCGCGCCGATCAACTGGGTGCCAGCGTGGTGGTGTCGATGGTAGAACGAAG CGGCGTCGAAGCCTGTAAAGCGGCGGTGCACAATCTTCTCGCGCAACGCGTCAGTGGGCTGATCATTAACTATCCGCTGGATGACCAGGATGCCATTGCTGTGGAAGCTGCCTGCACTAATGTTCCGGCGTTATTTCTTGATGTCTCTGACCAGACACCCATCAACAGTATTATTTTCTCCCAT GAAGACGGTACGCGACTGGGCGTGGAGCATCTGGTCGCATTGGGTCACCAGCAAATCGCGCTGTTAGCGGGCCCATTAAGTTCTGTCTCGGCGCGTCTGCGTCTGGCTGGCTGGCATAAATATCTCACTCGCAATCAAATTCAGCCGATAGCGGAACGGGAAGGCGACTGGAGTGCCATGTCC GGTTTTCAACAAACCATGCAAATGCTGAATGAGGGCATCGTTCCCACTGCGATGCTGGTTGCCAACGATCAGATGGCGCTGGGCGCAATGCGCGCCATTACCGAGTCCGGGCTGCGCGTTGGTGCGGATATCTCGGTAGTGGGATACGACGATACCGAAGACAGCTCATGTTATATCCCGCCG TCAACCACCATCAAACAGGATTTTCGCCTGCTGGGGCAAACCAGCGTGGACCGCTTGCTGCAACTCTCTCAGGGCCAGGCGGTGAAGGGCAATCAGCTGTTGCCCGTCTCACTGGTGAAAAGAAAAACCACCCTGGCGCCCAATACGCAAACCGCCTCTCCCCGCGCGTTGGCCGATTCATTAA TGCAGCTGGCACGACAGGTTTCCCGACTGGAAAGCGGGCAGTGAGCGCAACGCAATTAATGTGAGTTAGCGCGAATTGATCTGGTTTGACAGCTTATCATCGACTGCACGGTGCACCAATGCTTCTGGCGTCAGGCAGCCATCGGAAGCTGTGGTATGGCTGTGCAGGTCGTAAATCACTGCA TAATTCGTGTCGCTCAAGGCGCACTCCCGTTCTGGATAATGTTTTTTGCGCCGACATCATAACGGTTCTGGCAAATATTCTGAAATGAGCTGTTGACAATTAATCATCCGGCTCGTATAATGTGTGGAATTGTGAGCGGATAACAATTTCACACAGGAAACAGACCATG	lac operator: lac operator (fwd)
alsSD^{Bs}	pBV2xp_*alsSD*^{Bs}	ATGACAAAAGCAACAAAAGAACAAAAATCCCTTGTGAAAAACAGAGGGGCGGAGCTTGTTGTTGATTGCTTAGTGGAGCAAGGTGTCACACATGTATTTGGCATTCCAGGTGCAAAAATTGATGCGGTATTTGACGCTTTACAAGATAAAGGACCTGAAATTATCGTTGCCCGGCACGAACA AAACGCAGCATTCATGGCCCAAGCAGTCGGCCGTTTAACTGGAAAACCGGGAGTCGTGTTAGTCACATCAGGACCGGGTGCCTCTAACTTGGCAACAGGCCTGCTGACAGCGAACACTGAAGGAGACCCTGTCGTTGCGCTTGCTGGAAACGTGATCCGTGCAGATCGTTTAAAACGGACACA TCAATCTTTGGATAATGCGGCGCTATTCCAGCCGATTACAAAATACAGTGTAGAAGTTCAAGATGTAAAAAATATACCGGAAGCTGTTACAAATGCATTTAGGATAGCGTCAGCAGGGCAGGCTGGGGCCGCTTTTGTGAGCTTTCCGCAAGATGTTGTGAATGAAGTCACAAATACGAAAA ACGTGCGTGCTGTTGCAGCGCCAAAACTCGGTCCTGCAGCAGATGATGCAATCAGTGCGGCCATAGCAAAAATCCAAACAGCAAAACTTCCTGTCGTTTTGGTCGGCATGAAAGCGGAAGACCGGAAGCAATTAAAGCGGTTCGCAAGCTTTTGAAAAAGGTTCAGCTTCCATTTGTTGAAA CATATCAAGCTGCCGGTACCCTTTCTAGAGATTTAGAGGATCAATATTTTGGCCGTATCGGTTTGTTCCGCAACCAGCCTGGCGATTTACTGCTAGAGCAGGCAGATGTTGTTCTGACGATCGGCTATGACCCGATTGAATATGATCCGAAATTCTGGAATATCAATGGAGACCGGACAATTA TCCATTTAGACGAGATTATCGCTGACATTGATCATGCTTACCAGCCTGATCTTGAATTGATCGGTGACATTCCGTCCACGATCAATCATATCGAACACGATGCTGTGAAAGTGGAATTTGCAGAGCGTGAGCAGAAAATCCTTTCTGATTTAAAACAATATATGCATGAAGGTGAGCAGGTG CCTGCAGATTGGAAATCAGACAGAGCGCACCCTCTTGAAATCGTTAAAGAGTTGCGTAATGCAGTCGATGATCATGTTACAGTAACTTGCGATATCGGTTCGCACGCCATTTGGATGTCACGTTATTTCCGCAGCTACGAGCCGTTAACATTAATGATCAGTAACGGTATGCAAACACTCGGC GTTGCGCTTCCTTGGGCAATCGGCGCTTCATTGGTGAAACCGGGAGAAAAAGTGGTTTCTGTCTCTGGTGACGGCGGTTTCTTATTCTCAGCAATGGAATTAGAGACAGCAGTTCGACTAAAAGCACCAATTGTACACATTGTATGGAACGACAGCACATATGACATGGTTGCATTCCAGCAA TTGAAAAAATATAACCGTACATCTGCGGTCGATTTCGGAAATATCGATATCGTGAAATATGCGGAAAGCTTCGGAGCAACTGGCTTGCGCGTAGAATCACCAGACCAGCTGGCAGATGTTCTGCGTCAAGGCATGAACGCTGAAGGTCCTGTCATCATCGATGTCCCGGTTGACTACAGTGAT AACATTAATTTAGCAAGTGACAAGCTTCCGAAAGAATTCGGGGAACTCATGAAAACGAAAGCTCTCTAGCACTCTGCGCATCACGACACTGTTTTATGAACAGCACTAAATAAAAGGAGTGAAGGAAATATGAAACGAGAAAGCAACATTCAAGTGCTCAGCCGTGGTCAAAAAGATCAGC CTGTGAGCCAGATTTATCAAGTATCAACAATGACTTCTCTATTAGACGGAGTATATGACGGAGATTTTGAACTGTCAGAGATTCCGAAATATGGAGACTTCGGTATCGGAACCTTTAACAAGCTTGACGGAGAGCTGATTGGGTTTGACGGCGAATTTTACCGTCTTCGCTCAGACGGAACC GCGACACCGGTCCAAAATGGAGACCGTTCACCGTTCTGTTCATTTACGTTCTTTACACCGGACATGACGCACAAAATTGATGCGAAAATGACACGCGAAGACTTTGAAAAAGAGATCAACAGCATGCTGCCAAGCAGAAACTTATTTTATGCAATTCGCATTGACGGATTGTTTAAAAAGGT GCAGACAAGAACAGTAGAACTTCAAGAAAAACCTTACGTGCCAATGGTTGAAGCGGTCAAAACACAGCCGATTTTCAACTTCGACAACGTGAGAGGAACGATTGTAGGTTTCTTGACACCAGCTTATGCAAACGGAATCGCCGTTTCTGGCTATCACCTGCACTTCATTGACGAAGGACGCAA TTCAGGCGGACACGTTTTTGACTATGTGCTTGAGGATTGCACGGTTACGATTTCTCAAAAAATGAACATGAATCTCAGACTTCCGAACACAGCGGATTTCTTTAATGCGAATCTGGATAACCCTGATTTTGCGAAAGATATCGAAACAACTGAAGGAAGCCCTGAATAA	Acetolactate synthase gene (*B. subtilis*): *alsS* (fwd) Acetolactate decarboxylase gene (*B. subtilis*): *alsD* (fwD)
alsSD^{Bl}	pBV2xp-*alsSD*^{Bl}	ATGAATAATGTAGCCGCTAAAAATGAAACTCTTACTGTAAGAGGAGCAGAGCTTGTGGTGGATAGTCTCATTCAGCAAGGTGTCACTCATGTTTTCGGTATTCCGGGAGCGAAAATCGATGCGGTGTTTGACGTATTGAAAGACAAGGGGCCTGAATTGATCGTTTGCCGTCACGAGCAGAA TGCAGCATTTATGGCGGCGGCAGTCGGACGATTGACTGGAAAGCCCGGTGTTTGCCTGGTGACTTCAGGTCCGGGAGCGTCTAATTTAGCGACCGGTCTTGTAACAGCCAATACAGAAGGAGATCCGGTTGTTGCCCTGGCGGGTGCTGTAAAAAGAGCGGATCGTCTCAAAAAAACTCATCA ATCGATGGATAATGCGGCGTTGTTTCAGCCGATTACGAAATATAGCGCAGAAGTGGAAGATGCGAACAACATACCTGAGGCTGTAACCAATGCATTCAGAGCGGCGGCTTCTGGACAGGCTGGCGCAGCGTTTCTCAGCTTTCCGCAGGACGTTACGGCCGGTCCGGCAACTGCCAAGCCGGT GAAAACCATGCCGGCGCCGAAGCTGGGCGCGGCTTCGGACGAACAAATCAGCGCGGCCATCGCCAAAATTCACAATGCGAACCTTCCTGTCGTGCTTGTCGGGATGAAAGGCGGAAGACCTGAAGCGATTGAAGCGGTTCGGCGTCTGCTAAGGAAAGTGAAACTGCCGTTTGTTGAAACATA CCAAGCAGCGGGTACGCTGTCTCACGATTTGGAAGACCAGTACTTCGGCCGGATCGGACTATTCCGCAATCAGCCCGGAGACATGCTATTGGAAAAAGCGGATGTCGTTTTGACGGTCGGCTATGATCCGATTGAATACGATCCGGTCTTTTGGAATGGAAAAGGCGAACGAAGCGTGATTCA TCTTGACGAAATACAAGCCGATATCGATCATGACTATCAGCCCGAAATCGAGTTGATCGGCGATATCGCAGAGACGTTAAACCATATTGAACATGATTCTCTGCCGGTTTCCATCGACGAGTCCTTTGCACCTGTCCTTGATTACTTGAAGAAAGCACTGGAGGAGCAAAGCGAACCTCCTAA AGAAACAAAAACTGATCTTGTTCATCCGCTGCAAATCGTTCGCGATTTGCGTGAACTGCTGAGCGATGACATAACGGTGACTTGCGACATCGGCTCCCATGCGATTTGGATGTCTAGATATTTCCGCACCTACCGTCCGCATGGACTGCTGATTTCCAACGGCATGCAGACGCTTGGGGTGGCT TTGCCGTGGGCGATTGCAGCAACGCTGGTCAATCCGGGACAGAAAGTCGTGTCTGTTTCCGGGGACGGGGGCTTCCTGTTCTCCGCGATGGAGCTTGAGACAGCGGTCAGATTAAAAGCGCCGATCGTTCACATTGTCTGGAATGACAGCACATACGATATGGTTGCGTTCCAGCAGGAGATG AAATACAAGCGGACGTCCGGAGTCGACTTCGGCGGAATCGATATTGTAAAATATGCTGAAAGCTTTGGTGCAAAAGGTTTAAGGGTCAATTCACCTGACGAATTGGCAGAGGTGCTTAAAGCTGGTCTTGATGCAGAGGGGCCTGTTGTCATTGATATTCCGGTCGATTACAGCGACAACAT TCATTTGGCCGATCAGCGTTTTCCAAAAAAATTTGAGGAACATTTTAATAAAGAAGCCTCTAAGCAATCTTGATCACAGCATGTCCAGTCACAACGAACAAAATCAAGGGAGTGAAAAGAGGAAAATGAAAAGTGCAAGCAAACAAAAAATAATTCAGCCCGTTGATAAGAACCTCGATCA AGTCTATCAGGTCTCAACGATGGTATCTTTATTGGACGGAATTTACGACGGGGATTTTTATATGTCCGAAGCGAAGGAGCACGGAGACTTCGGGATCGGAACGTTCAACCGGCTCGACGGCGAGCTGATCGGTTTGACGGTGAGTTTTACCGTCTCCGTTCCGATGGAAAAGCCTACCCAGT TCAAGGAAGCGATTGTTCTCCATTTTGCTCGCTGGCTTTCTTCCGGCCGGATATCTATCACGAAATCAAGCAGCGGATGCCGCTTGAGGCGTTCGAAGAAGAAATGAAACGGATCATGCCGAGTGAAAACCTGTTTTACGCGATTCGCATGGACGGAACCTTTAAGAAAGTCAAAACGAGAAC AGTTGAACTTCAGGAAAAACCGTATGTGCCGATGGTTGATGCGGTAAAATCACAGCCGATCTTTGATTTTAATGATATTACGGGGACGATCGTCGGCTTTTGGACACCGCAATATGCCAACGGAATCGCAGTTTCCGGCTTCCATCTTCACTTTATAGATGAAGACCGCAATGTCGGCGGACA CGTTTTCGATTATGAAATCGAAGAATGCACGGTGCAAATTTCTCAAAAACTCAATATGAACCTCAGATTGCCGAATACGCAAGATTTCTTTCAAGCGGATTTCAATAAACACGATCTTGCAGCCGGAATTGAAGCGGCCGAAGGCAATCCCGAGTAA	Acetolactate synthase gene (*B. licheniformis*): *alsS* (fwd) Acetolactate decarboxylase gene (*B. licheniformis*): *budA* (fwd)
budAB^{Ec}	pBV2xp-*budAB*^{Ec}	ATGATGCACTCATCTGCCTGCGACTGTGAGGCCAGTTTATGCGAGACCCTGCGCGGGTTCTCCGCTAAGCATCCTGACAGCGTGATCTATCAGACATCGCTAATGAGCGCCCTGCTAAGCGGCGTCTACGAGGGGGACACCACCATCGCCGATCTGCTGGCGCACGGTGATTTTGGTCTGGGCA CCTTCAACGAGCTGGACGGCGAAATGATTGCCTTCAGCAGCCAGGTGTACCAGCTGCGCGCCGACGGCAGCGCACGCGCCGCGAAGCCAGAGCAGAAAACGCCGTTCGCGGTGATGACCTGGTTCCAGCCGCAGTACCGTAAAACCTTTGATGCGCCGGTCAGTCGTCAGCAGATCCACGACGT GATCGACCAGCAAATCCCCTCCGATAACCTGTTCTGCGCGCTGCGCATCGACGGCAACTTCCGCCACGCCCACACCGTACCGTACCGCGTCAGACGCCGCCATACCGCGCGATGACCGACGTGCTGGACGACCAGCCGGTGTTCCGCTTCAACCAGCGCGAAGGGGTGCTGGTCGGGTTCCGCA CGCCGCAGCATATGCAGGGCATTAACGTGGCCGGCTATCACGAACATTTCATTACCGACGACCGTCAGGGCGGGGGACATCTGCTCGACTATCAGTTGGAGAGCGGCGTGCTCACCTTTGGCGAAATACACAAGCTGATGATCGATCTGCCAGCCGACAGCGCGTTTTTACAGGCCAACCTTCA CCCCAGCAATCTTGATGCAGCGATCCGTTCCGTCGAAAACTAACAGGAGAACTACCGTGAACAGTGAGAAACAGTCACGTCAGTGGGCGCATGGCGCCGATATGGTTGTAGGTCAACTGGAAGCGCAGGGCGTGAAGCAGGTGTTCGGGATCCCGGGGGCGAAAATCGACAAAGTCTTTGACT CCCTGCTGGACTCCTCCATTGAGATCATCCCCGTACGCCACGAGGCAAACGCGGCGTTCATGGCGGCGGCGGTAGGGCGCCTGACCGGCAAAGCCGGGGTGGCGCTGGTCACCTCCGGCCCGGGCTGTTCCAACCTGATCACCGGTATCGCCACCGCCAACAGCGAAGGCGACCCGGTGGTGGCG	Acetolactate decarboxylase gene (*E. cloacae*): *budA* (fwd)

		CTGGGCGGGGCGGTGAAGCGGGCGGATAAAGCCAAGCTGGTGCACCAGAGCATGGATACGGTTGCCATGTTCAGCCCGGTCACCAAATACGCTGTTGAAGTCAGCTCTCCGGATGCGATTGCTGAAGTGGTGTCGAACGCATTCCGTGCCGCCGAGCACGGCAGGCCGGGCGGTGCGTTCGTC AGCCTGCCGCAGGATATTGTTGACCAGCCTGCCACGGGGGCGATTTTACCGGCCAGCGGCCCGGCGCTGATGGGCCCGGCTCCTGAATCGGCCATTAACGACGTGGCGAAACTCATCGACAACGCCAAAAACCCGGTGATCCTGCTGGGGCTGATGGCGAGCCAGCCTGCTAACAGCGCGGCGC TGCGTAAGCTGCTGGAGAAAAGCCGCATTCCGGTCACCAGCACCTATCAGGCCGCCGGGGCGGTGAACCAGGAGCATTTCACCCGCTTCGCCGGACGCGTTGGCCTCTTTAACAACCAGGCGGGTGACCGCCTGCTGCACCTGGCGGATCTGATTATCTGTATCGGCTACAGCCCGGTTGAGTA TGAGCCGTCCATGTGGAACAGCGGCGACGCCACGCTGGTGCATATTGATGTACTGCCTGCGTATGAAGAGCGCAATTATGTCCCTGACATCGAGCTGGTGGGCGACATCGCCGCCACGCTGAACCTGCTTGCCAGCCGGATTGACCACAAGCTGGAGCTCAGCCAGCGTGCGTCAGAAATCCTG GTCGATCGCCAGCATCAGCGCGATCTGCTCGATCGCCGCGGTGCCTCGCTCAACCAGTTTGCCCTGCATCCACTGCGTATCGTTCGCGCCATGCAGGACATCGTCAATAACGACGTGACGCTGACCGTCGACATGGGCAGCTTCCACATCTGGATCGCCCGCTACCTCTACAGCTTCCGGGCGCG CCAGGTGATGATCTCCAACGGTCAGCAGACCATGGGCGTTGCGCTGCCGTGGGCCATTGGCGCGTGGCTGGTCAACCCGGGCCGCAAGGTGGTGTCGGTGTCCGGTGACGGCGGCTTCCTGCAGTCGAGCATGGAGCTGGAAACCGCGGTGCGCCTCAACGCCAACGTGCTGCACATCATCTGG GTGGATAACGGCTACAACATGGTCGCCATTCAGGAAGAGAAAAAATACCAGCGTCTTTCCGGCGTGGCGTTCGGCCCGGTTGACTTCAAAGCCTATGCCGACGCCTTTGGCGCCAGGGGCTTTGCCGTGGAGAGCGCCGATGCCCTTGAATCGACGCTGCGTGCGGCGATGGATGTGAATGGC CCGGCCGTGGTGGCCATTCCCGTTGACTACAGCGATAACCCGCTGCTGATGGGCCAGCTCCATCTCAGCCAGATTTTGTGA	Acetolactate synthase gene (*E. cloacae*): *budB* (fwd)
aceBA^{Bm}	pBV2xp-*aceBA*^{Bm} pEC-XT99A-*aceBA*^{Bm}	ATGTCCACTCAAACGACAGGCATTGAAATCGTTGGTTCGATCAAACCGGGATATGAAGAAATCCTAACAGCAGAAGCACTCAATTTTATTGAAGAATTGGAAAGAAAGTTTGGTCCACGGAGAAAAGAACTGCTGCAGCTCCGGCAAAAAAGGCAAGAAGAAATCAACCAGGGAAAACTCCC GGATTTTCTTCCTGAAACAGAGCATATTCGAAACGGGGATTGGACAATCTCGCCGCTTCCAGACGATCTACGTGACAGACGTGTGGAAATTACCGGACCAACCGATCGAAAAATGATAATAAATGCGTTGAATTCCGGTGCCAAAATCTTTATGGCAGATTGTGAGGACGCCACTTCACCAAC TTGGGAAAACATTGTCGAAGGGCAGATTAATCTTAGAGATGCAGTGAACCGGACGATCTCGTTCGAAAATCCAAACGGCAAGAAATATGTTCTTAATGAAAAAACAGCTGTACTTCTTGTTCGTCCAAGAGGCCTTCATCTTGAAGAAAAACATTTGCTGCTTGATGGAAAACCGATTTCCG GCAGTTTCTTCGATTTTGGAATGTACTTTTTCCATAATGCAAAAAATCTGATTGCGAGAGGAACCGGCCCTTATTTTTACTTGCCGAAGCTTGAAAGCCATCTTGAAGCAAGACTGTGGAATGACGTATTTGTTTATTCACAGGAAAAGCTGGGTATCCCTCAAGGGACAATAAAAGCAACG GTTCTTATTGAAACGATTTTGGCTGCGTTCGAAATGCATGAGATCTTATATGAATTAAGGGAGCATTCTGCCGGATTGAACTGCGGACGCTGGGATTATATTTTCAGCTACTTGAAAAAGTTCCGCAATCACGAAAATGTCATCTTGCCTGATAGATCACAGGTGACAATGACTGTTCCGTTT ATGAGATCTTACTCACTGCTGACGATTCAGACTTGCCACCGCCGTAAAGCGCCGGCAATTGGAGGTATGGCGGCACAAATTCCTGTTAAAAACAATCCGAAAGCAAATGAAGAAGCTTTTGCAAAAGTACGTGCCGATAAAGAACGGGAAGCACGCGACGGTCATGATGGGACATGGGTAGC ACACCCTGCTTTAGTTCCGGTTGCGCTAGAAGTTTTTAATCGGGAAATGCCTGATGCCAATCAAATTGAAACGAAAAAACTTGAAGAACTTAACGTTTCAGCCAGTGACTTACTCGAAGTTCCTGAGGGAACGATCACAGAAAATGGTGTCCGAATGAACATCAATGTCGGAATCCAATATG TGGCATCTTGGCTAAGCGGCAGAGGCGCAGCGCCTATCCATAATCTAATGGAAGATGCTGCTACAGCAGAAATTTCAAGGGCACAGCTTTGGCAATGGATCCGCCATCCAAAAGGTATTTTAGATGACGGCAGAAAAGTGACCGTTGAGATGTATGAGCAGTTTAAGAAAGAAGAGCTCGAA AAATTAAACAGGAAATCGGTGCTGAAGCTTATGCTAATGGCCGGTTTGAAGAGGCAGTTGAATTGTTTGACAAGCTAATATTAAACGATGAGTTTGCTGAATTCCTAACTCTTCCGGGTTATGAAATTCTATAGATTAATATAATCATAAATTTTAAGGAGGATTTAAACATGACAGATT CTAGAGTACAACAATTACAGGAAAGCTGGGAAAAGGATTCGCGCTGGAAAGGAATTACCCGTCCTTATTCAGCAGAAGATGTAATCAAATTACGTGGGTCAATTGACATTGAGTATACATTGGCACGCCGCGGTGCGGAAAAGCTTTGGAAGCTTGTAAATGAAGAAGATTTTGTAAATGCC CTTGGTGCACTTACAGGCAATCAGGCTGTTCAGCAAGTAAAAGCCGGACTGAAAGCTATTTACTTAAGCGGCTGGCAAGTTGCAGCTGATGCAAACTTGGCAGGTCATATGTACCCTGACCAAAGTTTATATCCGGCAAATAGTGTTCCGCACGTAGTAAAACGTATTAATCAAGCGTTGCAG CGTGCTGACCAAATCCATCATGCTGAAGGGGACATTCAATTGATTGGTTTGCTCCGATCGTAGCTGATGCAGAAGCAGGCTTTGGCGGACAGCTGAACGTGTTTGAATTGATGAAAGCGATGATTGAAGCCGGGGCTGCAGGGGTTCACTTCGAAGATCAGCTTTCTTCAGAAAAGAAATG CGGACACCTTGGAGGAAAAGTATTACTTCCAACACAAACTGCAGTGAAAAACTTGATTGCTGCACGTTTAGCAGCTGATGTAATGGGTGTACCAACAGTGTTAATTGCTCGGACAGATGCAAACGCAGCGGATATGGTAACAAGTGATGTGGATCCATACGATGCTCCGTTCATTACTGGAG AGCGTACAGAAGAAGGATTCTTCCGCACAAAAGCTGGTTTAGATCAAGCGATTGCTCGCGGATTGGCATATGCACCGTATGCTGATATGATCTGGTGTGAAACATCTGAGCCAAACTTAGAGGAAGCAAGACGATTTGCGGAAGCTATTCATGAGAAGTTCCCTGGCAAGCTGTTAGCTTAC AACTGCTCACCATCATTTAACTGGAAGAAAAAGCTTGATGATGAAACGATTGCGAATTTCCAAATTGAGCTCGGAAAAATGGGCTACAAGTTCCAATTCGTTACACTAGCAGGATTCCATACATTGAACCACAGCATGTTCGAACTAGCACGTCAATACAAAGACCGCGGAATGGCGGCTTA TTCTGAATTGCAGCAAGCTGAATTTGCAAGTGAAAAGTACGGCTATACAGCTACAAGACACCAGCGTGAAGTTGGCACAGGCTACTTTGATGAAGTTGCCATGGTGATCAGTGGTGGAAGTTCTTCAACTACTGCATTAAAAGGCTCAACGGAAGTAGAACAATTTATCGCCGCAAAATAA	Malate synthase gene (*B. methanolicus*): *aceB* (fwd) Isocitrate lyase gene (*B. methanolicus*): *aceA* (fwd)
citM^{Ll}	pMI2mp-*citM*^{Ll}	ATGGTTGATTTTAATAAAGTTTTAGATTTACACGAATTACACACAGGTGTATTGGATATTCAAGCAGACATTGATGTCAAAAAGCCAAGTGATCTGGCTGAGGCTTATACACCGGGTGTTGCCGAACTTTCAAAATTAATTCAGAGTGACCCAGAAGCTAAACGCAAATACACAATGAGCGG AAAACTGGTGGCCGTTGTGACTGATGGAACAGCTGTTCTTGGTCTTGGAAATATGGGGCCTGCTGGTGGACTCCCTATCGTTGAGGGGAAAGCCCTTCTGTACAAGGAATTAGCTGGTGTCGATGCAATACCGATTGCTGTGGAACAAATCGGTGCTGAAAAAATCATCGAAACAATTAAAA ATATTTCGCAATCTTTTGCTGGTATTCACTTGGAAGATATCTCAGCTCCTCAATGTTTTGAAATTGAGGAACGACTTTCTAAAAATTTGAATATTCCAGTTTATCATGATGACCAAGCTGGGACAGCTATCGTTGTCTTAGCAGGTTTGATGAATGCAGCCAAGTTAGTTAATAAGAAATTG GAAGACTTGAAGATTGTCATCAATGGTGTTGGTGCAGCTGGTGTTGCAACCGGGCGATTATTTGCTGAGGTTGGCATTAAAAATGTGACCTTGATTGATATTGAAGGAAAAGTTAACGATAAGGTGAAATCTTATAATCGTTATCAGTTGGAATTGGCTAAACGCTTTAATCAAGTAGCTGG GACGACTTTGGATGAAGTGATTGACGGTCAAGATGTCTTTATTGGTTTGTCAGATGCCAAAGTTTTGACTGGGACACAAGTTGAACGCATGGCAAAAGATGCAATTATCTTTGCTTTAGCAAATCCAGTGCCAGAAATCTTACCAGAAGAAGCGCTCAAGCATGGAGCTGCAGTTGTTGCAA CAGGCTCTAATCAATGGCCAAATCAAGTCAATAATGTTTTGGTGTTCCCTGGCTTGTTTAAAGGTTTATTGAGTGCGAATGTTCAGCACGTAGATTACAAGTTGCAAGCTAATATTGCGACAGCCATTGCTGATGTCATTAAAAATCCAGATCGGAATCACATTGTTCCTGGGGTATTTGAT GCAGGAGTTGTAGAAAGTGTCACAAAAGCGGTAAAAGATTCAGCAAAATAA	Malic enzyme gene (*L. lactis*) : *citM* (fwd)
mae^{Gs}	pTH1mp-*mae*^{Gs} pTH1mp-*mae*^{Gs}-*aceA*^{Bm}	ATGGCATTACCAGGCGGGGCAGCCATGAACATTACGATTCGTCTCCAGTTCGAAAAAGATATCGTCTCATTCAGCGATATCGCCGCCGCGATTGGCAAAGCGGGCGGGGACATTGTCGGGATTGACGTCATTTCGTCAAGCAAAGTTCACACGGTGCGCGATATTACCGTCAGCGCCCTCGAT ACGAAGCAGTGCGACTTGATCATTGAGGCGCTGAAAAAAATTCGCGGCGTCAAAATTGTGAACGTTTCCGACCGCACGTTTTTGATGCACATCGGGGGGAAAATTGAAACAAATTCAAAAATCCCAGTGAAAACACGCGACGACTTGTCGCGGGTATACACGCCGGGCGTGGCGCGCGTCTGC ACGGCGATTGCCGAAGATCCGCGAAAGGCGTATTCGCTGACGATTAAACGGAATACGGTCGCCGTTGTCTCGGACGGCACGGCGGTGCTTGGGCTTGGCGACATCGGTCCGTACGCGGCGATGCCAGTCATGGAAGGGAAAGCGATGCTGTTTAAGGAATTTGCCGGAGTGGACGCGTTCCCG ATTTGTTTGGATACGAAAGACACGGAAGAAATCATTCAAATTGTGAAAGCGATCGCCCCGGCGTTTGGCGGCATTAACCTGGAGGACATTTCCGCCCCACGTTGTTTTGAAATTGAAAAGCGGCTGAAAGAAGAGCTGGATATTCCCGTGTTTCATGATGACCAGCATGGCACGGCGGTCGTG CTCTTGGCGGGACTGCTTAACGCGCTGAAAATCGTTGACAAAAAGCTCGAAGACATTAAAGTCGTCTTAACCGGCATCGGTGCGGCCGGCATCGCCTGCACGAAAATTTTGCTTGCGGCCGGCGTGCGCAACATTATCGGGGTCGACCGCCATGGCGCCATCCACCGCGATGAAACGTACGAAA ATCCGTACTGGCAAGAGTATGCGCAACTCACGAACCCGGATAATCTGAAAGGAAGCTTGTCCGATGTCATCGCCGGCGCAGATGTATTTATCGGCGTTTCGGCTCCGGGCATTTTAAAAGTGGAAGATGTGAAAAAAATGGCGCGCGATCCGATCGTCGTTTGCGATGGCCAACCCGATTCCGG AAATTGATCCGGAGCTGGCCGAACCGTACGTGCGCGTCATGGCGACCGGGCGTTCCGACTATCCGAACCAAATCAACAACGTCCTTTGCTTCCCGGGCATTTTCCGCGGGGCGCTTGACTGCCGGCGACGAGAAATTAACGAGGAAATGAAGCTCGCTGCCGCGAAGGCGATTGCCTCTGTCGT GACGGAGGATGAATTGAACGAAACATACATCATCCCGAGCGTCTTCAACAGCAAAGTCGTCGAACGCGTCAGACAAGCGGTCGTCGAAGCGGCTTACCGCACTGGGGTGGCGCGGAAGGACAATATCCCGGTTGGCGGATATACAGGGCAGTAA	Malic enzyme gene (*G. stearothermophilus*)
mae^{Bl}	pTH1mp-*mae*^{Bl}	ATGAACAACATGAGAAGAACGAAGGAAGGACATTTGGAGACTTCTTTGCGGGGTAAAGACGTTCTTTCCATTCCAACGCTAAATAAAGGTGTTGCATTTTCTCTTGAAGAAAGAAAGAACCTCGGTCTAGAAGGGCTTCTGCCGCCGACTGTTCTCAGCCTTGATCAGCAGGCAGAACGGGC TTACGAACAATTTTCCCGTCAACCTGACAGACTTCGCCAAAACGTATATTTGAACGATCTGCAAAACAGAAACGAAGTGCTTTTCTATAAATTATTGCAAAACCACCTGCGTGAAATGCTTCCGGTTGTCTATACGCCTACTGTCGGCGAAGCGATTCAGGAATACAGCCACGAATACCGCAG ACCGCACGGCGTTTACTTGTCAATCGATGATATGGACGGAATCGAAACGGCTTTTAAAAACCTGCAGGCATCTGCTGATGACATCGATTTGATCGTCGCTACAGATTCCGAAAGCATTTTGGGGATCGGCGACTGGGGCGTCGGAGGCATCAATATTGCGATTGGTAAGCTTGCAGTATATAC GGCGGCAGCGGGAATCGATCCGAGCCGCGTTATCCCGGTCGTACTGGATGTCGGAACGAATAATGAAAAACTGCTAAACGATCCGCTCTATATCGGAAACCGTCATCCGCGTGTAGAAGGCGAGCGCTATGAACAATTTATCGACGCTTATGTCGAAACAGCATTGAAGCTTTTCCCTAACGC GCTTCTACACTGGGAAGATTTCGGAAATAAAAATGCCCGCAATATCATGAGTAAATATAACCATAAAATTGCAACATTTAATGATGATATTCAAGGAACAGGGGCTATCACGCTGGCTGCGATTTTAGCAGCTGTCAAAAAGACCGGCACGTCTTTGAAAGACCACCCGGGTCGTCATCTTCG GACCTGGTTCTGCTGGTATAGGAATCGCTGACCAAATCCGCGACACCATGGTGCTTGAAGGGCTTTCAGAAGAAGAAGCCAACCGTGCATTCTGGACAGTCGATTACAGAGGATTATTAACGACAGGCATGGATCAAATCATGGATTTCCAAGAACCGTATTTGCGCGATACGGAAGAAGTG AAAGATTGGAAACGCAATGAAAAGGGAGAGATTTCCTTTGAGGAAGTCATCCGTCAAGTGAAGCCTACGATCCTGATTGGTACATCAGGTGTTGCCGGCGCCTTTAGTGAAGAAATCATCAAAGAGATGGCGGCTCATACTGAGCGTCCTGTGATTCTGCCGATGTCAAATCCGACACATCT GGCCGAAGCTGTTCCTGAAGACTTGTTCAAATGGACGGACGGAAAAGCGCTTGTGGCGACGGGAAGCCCGTTTGAAGCTGTTGAGTACAATGGCGTGAAACACGAAATCGGACAATCCAATAACGCTTTTGTATTCCCTGGATTAGGCCTGGGTACAATCGTTGCGAAAGCGAAAGTCATCA	NAD-dependent malic enzyme gene (*B. licheniformis*)

		CAAACGGCATGTTTGCTGCATCTGCCAACGCGGTCGCGAACATGGTGGATCATGAAAAGCCGGGTGCAGGTCTTCTGCCGAAAATCGACGACCTGCAAGACGTATCCGTTCAAGTGGCGATCGACGTTGTAAAAGCTGCCATTAAAGACGGCGTGGCCCAAGTTCAGCCTGAAGATGTCGAAA AGGCTGTCCGCGAAGCCATGTGGCGTCCGGAGTATAAAACAATTGTTGCAAAACAAGACTAA	
odx^{Cg}	pTH1mp-*odx*^{Cg}	ATGCGTTTTGGACGAATTGCCACCCCAGATGGAATGTGTTTTTGCTCAATTGAAGGCGAAGGCGATGATGTAGCTAACCTCACCGCCCGTGAGATCGAGGGTACCCCCTTCACTGAACCAAAGTTCACCGGTCGCGAATGGCCACTTAAAGATGTACGCCTGCTGGCACCAATGCTGCCAAGC AAAGTCGTCGCGATTGGCCGTAACTACGCCGATCACGTTGCTGAGGTGTTTAAGAAGTCCGCAGAATCACTGCCACCAACCCTGTTCCTGAAGCCACCAACAGCTGTCACCGGACCAGAGTCCCCAATCCGAATCCCTTCCTTTGCCACCAAGGTGGAATTCGAAGGTGAGCTCGCAGTAGTTA TCGGCAAGCCCTGCAAGAACGTCAAGGCTGATGACTGGAAGTCTGTCGTTTTGGGCTTCACCATCATCAACGACGTCTCCTCCCGTGACCTCCAGTTCGCTGACGGCCAGTGGGCACGCGCTAAGGGCATTGACACCTTCGGCCCCATCGGACCATGGATTGAAACTGACATCAACTCCATCGA CTTGGACAACCTGCCCATCAAGGCACGCCTCACCCACGACGGCGAAACCCAATTGAAGCAGGACTCCAACTCCAACCAGATGATCATGAAGATGGGCGAAATTATCGAGTTCATCACCGCCTCCATGACCCTGCTCCCAGGCGACGTTATTGCAACCGGTTCTCCAGCAGGCACCGAAGCAATG GTTGACGGCGACTACATCGAAATCGAAATTCCAGGCATCGGCAAGCTGGGCAACCCAGTTGTGGACGCCTAA	Oxaloacetate decarboxylase gene (*C. glutamicum*): *odx* (fwd)
pckA-pyk^{Bm}	pTH1mp-*pckA-pck*^{Bm}	ATGAATTCTGTTACGATTTCAAGCGAGTTGAGTGATTTGTTAAAAGGAAATAATGTTCAAATTCAATTGTCCGTCCCTCAATTAGTTGAGAAAGTTTTATACCGTAAAGAAGGGACTTTGACTTCAACCGGAGCAGTCCGCGCCACACCGGGAAATATACCGGACGTTCGCCTAAAGATAA ATATATTGTTGAAGAAGCTTCTACGAAAGATAAAATCGATTGGGGCACTGTTAATCAGCCAATTTCCGAAGAAGCATTTACTAAACTATATAATAAAGTTATCAACTATTTGAAGGAAAAAGATGAAATATTTGTATTCAAAGGATTTGCGGGTGCTGACAAGAAATACCGCATGCCAATT CAAGTAATAAATGAATATGCATGGCATAACCTGTTTGCCCATCAATTATTTATCCGCCCTACAGAAGAAGAATTGTTGGAGCATCAAGCGGAATTCACCGTGATTTCCGCACCAAATTTTAAAGCAGATCCTGCAGTTGATGGTACTAGATCGGAAACGTTTATCATTATTTCTTTTGAACGT CGCACCGTATTAATTGGCGGTACAGAATATGCAGGAGAAATGAAAAAATCTATTTTCTCTGTCATGAACTATATGCTTCCAGAAAACGGGATCCTATCTATGCATTGTTCTGCAAATGTAGGCAGTGAGGGAGATGTTGCTTTATTCTTCGGCCTTTCAGGTACAGGAAAAACAACATTGTC AGCTGATCCAAACCGCCGACTTATTGGTGATGATGAGCATGGCTGGTCTCCAAATGGCGTATTTAATATTGAGGGTGGCTGCTATGCGAAATGCATCAATCTTTCCCGTGAAAAAGAACCGCAAATTTTTGATGCCATCCGTTTCGGTTCAGTTTTAGAAAATGTTGTGATTAATTTAGAAA CACGCGTTCCCGACTATGATGACAGCACATTAACAGAAAATACACGTGCAGCTTATCCGATTCAAGCGATTGACAATATCGTTGATCCAAGCGTTGCCGGCCATCCGAACACAATTATTTTCTTAACTGCTGATGCTTTCGGAGTGCTCCCACCGATAGCAAAACTAACCAAGGAACAGGCAA TGTACCACTTCTTAAGTGGCTATACATCCAAGCTTGCCGGAACAGAGCGCGGAATTACTTCTCCGCAAGCAACATTCTCAACTTGCTTTGGATCTCCGTTCCTTCCACTTCCTGCAACGCGCTATGCGGAAATGCTTGGAGAAAAAATCGATGAGCATAACGCAAACGTATTTCTAGTCAATAC AGGCTGGACCGGCGGCGAATACGGCACAGGCACGCGCATGAAGCTCGCTTATACACGTGCGATGGTTCAAGCTGCTCTGGAAGGAGAACTGAACAACACGGAAACCGTTAAAGATAAATTCTTTGGACTAGAAATTCCTTTACATGTTCCCGGCGTTCCTGATGAAGTCCTTCAGCCAAACAA AACATGGGAATGCCAGGAAGCATATGAAGCAAAAGCAAAAGAACTTGCAGAAAAATTCCGTGAGAACTTCAAAAAGTTTAAAAATGTTCCTGCTGAAATTGAAGAAAAAGGCGGTCCTATCGCATAAGTAAACAATTACATAAATAGGAGGTAGTAAGAATGCGCAGAACAAAAATCGTTT GTACGATTGGTCCGGCAAGTGAAAGTGTGGAGAAGCTTACGCAATTAATAGAAGCGGGAATGAATGTTGCACGTCTGAATTTTTCACATGGGAACCACGAAGAACATGCCCAGCGGATTAAAAACATTCGGGAAGCTGCAGAAAGAACCGGCAAAAATATTGCGATCCTTCTTCGACACGAAA GGTCCTGAAATACGCACGCATGATATGGAAAACGGTGCTATCGAATTAAAAGCCGGACAGGAAATTATTATTTCTATGAAAGAAGTCTTGGGAACGCCTGAAAAATTTTCAGTTACATATACGGGTTTAATTGATGATGTTCAAAAAGGCTCAAAAATCTTGCTAGATGACGGATTAATCGA ACTTGAAGTAACCAAAATCGACAAAGCTAATAATGAAATTCATACAAAAATCTTAAACAGCGGCATCTTAAAAAATAAGAAAGGTGTCAATGTTCCGGGAGTATCTGTCAAACTTCCGGGAATAACAGAAAAAGATGAAAATGATATTATTTTTGGGATTGAGCATGGCATAGATTTTATA GCCGCCTCATTTGTCAGAAGAGCAAAAGATGTGCTTGAGATCCGCCAATTGTTAGAAGAACGAAATGCGACTAATATTCATATTATCCCTAAGATTGAAAATCAAGAAGGGGTCGACAATATTGATGAAATTTTAGAAGTATCAGACGGTTTAATGGTAGCAAGGGGTGACCTCGGAGTAGA ACTTCCTGCTGAAGAAGTTCCTCTTGTTCAGAAAAAACTGATCAAAAAATGCAATGCGCTTGGAAAACCGGTAATTACTGCTACGCAAATGCTTGATTCCATGCAAAGAAATCCACGGCCGACACGTGCGGAAGCAAGTGACGTAGCAAATGCGATCTTTGACGGAACAGACGCAATTATGC TTTCCGGTGAAACAGCTGCTGGACAATATCCTGTAGAGGCTGTCCAGACAATGCATAATATTGCATCACGAGCTGAATCTGCATTAAATCACAATGAGATATTATCGATACGAAGCAAAGACAATGAACACAATATTACAGATGCAATTGGCCAATCGGTTGCCCATACAGCATTAAATCTG GATGTAAATGCGATTATAACGCCTACAGAAAGCGGTCATACAGCAAGGATGATTTCGAAATATCGGCCAAAAGTGCCGATTGTGGCAGTTACATCAAATGACTTTGTCCGCCGCCGTCTGGCATTAGTTTGGGGAGTATATCCATTACTTGGAAAAGAAGCTACCACAACAGACGAAATGCT TGAGATTGCTGTTCAGGAAAGTCTTAATAGTGGAATTGTTACCAATGGCGATTTAGTAGTTATAACTGCAGGCGTTCCAGTTGGAGAGAGCGGAACGACAAACCTTATGAAAATTCATGTAGTAGGTGATTCTATTATCAAGGGACAAGGGATCGGAAGAAAATCTGCGTACGGAAAAGTC GTGATCGCCCGAGATGCAAAAGAAGCTTTAAGCAAAGTGAAAGAAGGCCATATTTTAGTGACACTCGGTTCCGACCCGGAAATGATACCTGCTATTGAGAAATGCAGCGCCCTTATTACCGAGGAAGGCGGATTGACAAGCCATGGAGCAGTTGTTGGCTTAAACATTGGCATTCCTGTTAT TGTTGGTGCTGAAAATGCAACAAAAATTCTAAAAGATGGGCAAGAAATCACTGTGGATGCAGCACGTGGAATTATTTACAACGGTCATGCGAGCGTATTATAA	Phosphoenolpyruvate carboxykinase gene (*B. methanolicus*): *pckA* (fwd) Pyruvate kinase gene (*B. methanolicus*): *pyk* (fwd)
mae^{Gs}-*aceA*^{Bm}	pTH1mp-*mae*^{Gs}-*aceA*^{Bm}	ATGGCATTACCAGGCGGGGCAGCCATGAACATTACGATTCGTCTCCAGTTCGAAAAAGATATCGTCTCATTCAGCGATATCGCCGCCGCGATTGGCAAAGCGGGCGGGGACATTGTCGGGATTGACGTCATTTCGTCAAGCAAAGTTCACACGGTGCGCGATATTACCGTCAGCGCCCTCGAT ACGAAGCAGTGCGACTTGATCATTGAGGCGCTGAAAAAAATTCGCGGCGTCAAAATTGTGAACGTTTCCGACCGCACGTTTTTGATGCACATCGGGGGGAAAATTGAAACAAATTCAAAAATCCCAGTGAAAACACGCGACGACTTGTCGCGGGTATACACGCCGGGCGTGGCGCGCGTCTGC ACGGCGATTGCCGAAGATCCGCGAAAGGCGTATTCGCTGACGATTAAACGGAATACGGTCGCCGTTGTCTCGGACGGCACGGCGGTGCTTGGGCTTGGCGACATCGGTCCGTACGCGGCGATGCCAGTCATGGAAGGGAAAGCGATGCTGTTTAAGGAATTTGCCGGAGTGGACGCGTTCCCG ATTTGTTTGGATACGAAAGACACGGAAGAAATCATTCAAATTGTGAAAGCGATCGCCCCGGCGTTTGGCGGCATTAACCTGGAGGACATTTCCGCCCCACGTTGTTTTGAAATTGAAAAGCGGCTGAAAGAAGAGCTGGATATTCCCGTGTTTCATGATGACCAGCATGGCACGGCGGTCGTG CTCTTGGCGGGACTGCTTAACGCGCTGAAAATCGTTGACAAAAAGCTCGAAGACATTAAAGTCGTCTTAACCGGCATCGGTGCGGCCGGCATCGCCTGCACGAAAATTTTGCTTGCGGCCGGCGTGCGCAACATTATCGGGGTCGACCGCCATGGCGCCATCCACCGCGATGAAACGTACGAAA ATCCGTACTGGCAAGAGTATGCGCAACTCACGAACCCGGATAATCTGAAAGGAAGCTTGTCCGATGTCATCGCCGGCGCAGATGTATTTATCGGCGTTTCGGCTCCGGGCATTTTAAAAGTGGAAGATGTGAAAAAAATGGCGCGCGATCCGATCGTGTTTGCGATGGCCAACCCGATTCCGG AAATTGATCCGGAGCTGGCCGAACCGTACGTGCGCGTCATGGCGACCGGGCGTTCCGACTATCCGAACCAAATCAACAACGTCCTTTGCTTCCCGGGCATTTTCCGCGGGGCGCTTGACTGCCGGCGAGAGAAATTAACGAGGAAATGAAGCTCGCTGCCGCGAAGGCGATTGCCTCTGTCGT GACGGAGGATGAATTGAACGAAACATACATCATCCCGAGCGTCTTCAACAGCAAAGTCGTCGAACGCGTCAGACAAGCGGTCGTCGAAGCGGCTTACCGCACTGGGGTGGCGCGGAAGGACAATATCCCGGTTGGCGGATATACAGGGCAGTAACATATGGTACCCGCCATAGGTCTAGATCC ATATGGTACCCGCCATAGGTCTAGAGCTTGTAAACAATTACATAAATAGGAGGTAGTAAGAATGACAGATTCTAGAGTACAACAATTACAGGAAAGCTGGGAAAAGGATTCGCGCTGGAAAGGAATTACCCGTCCTTATTCAGCAGAAGATGTAATCAAATTACGTGGGTCAATTGACATT GAGTATACATTGGCACGCCGCGGTGCGGAAAAGCTTTGGAAGCTTGTAAATGAAGAAGATTTTGTAAATGCCCTTGGTGCACTTACAGGCAATCAGGCTGTTCAGCAAGTAAAAGCCGGACTGAAAGCTATTTACTTAAGCGGCTGGCAAGTTGCAGCTGATGCAAACTTGGCAGGTCATAT GTACCCTGACCAAAGTTTATATCCGGCAAATAGTGTTCCGCACGTAGTAAAACGTATTAATCAAGCGTTGCAGCGTGCTGACCAAATCCATCATGCTGAAGGGGACCATTCAATTGATTGGTTTGCTCCGATCGTAGCTGATGCAGAAGCAGGCTTTGGCGGACAGCTGAACGTGTTTGAATT GATGAAAGCGATGATTGAAGCCGGGGCTGCAGGGGTTCACTTCGAAGATCAGCTTTCTTCAGAAAAGAAATGCGGACACCTTGGAGGAAAAGTATTACTTCCAACACAAACTGCAGTGAAAAACTTGATTGCTGCACGTTTAGCAGCTGATGTAATGGGTGTACCAACAGTGTTAATTGCTG GGACAGATGCAAACGCAGCGGATATGGTAACAAGTGATGTGGATCCATACGATGCTCCGTTCATTACTGGAGAGCGTACAGAAGAAGGATTCTTCCGCACAAAAGCTGGTTTAGATCAAGCGATTGCTCGCGGATTGGCATATGCACCGTATGCTGATATGATCTGGTGTGAAACATCTGAG CCAAACTTAGAGGAAGCAAGACGATTTGCGGAAGCTATTCATGAGAAGTTCCCTGGCAAGCTGTTAGCTTACAACTGCTCACCATCATTTAACTGGAAGAAAAAGCTTGATGATGAAACGATTGCGAATTTCCAAATTGAGCTCGGAAAAATGGGCTACAAGTTCCAATTCGTTACACTAGC AGGATTCCATACATTGAACCACAGCATGTTCGAACTAGCACGTCAATACAAAGACCGCGGAATGGCGGCTTATTCTGAATTGCAGCAAGCTGAATTTGCAAGTGAAAAGTACGGCTATACAGCTACAAGACACCAGCGTGAAGTTGGCACAGGCTACTTTGATGAAGTTGCCATGGTGATCA GTGGTGGAAGTTCTTCAACTACTGCATTAAAAGGCTCAACGGAAGTAGAACAATTTATCGCCGCAAAATAA	Malic enzyme gene (*G. stearothermophilus*): *mae*^{Gs} (fwd) Isocitrate lyase gene (*B. methanolicus*): *aceA* (fwd)