APPENDICES

Appendix A

GenBank Entry for *Escherichia coli* partial PMI mRNA

```
LOCUS       ECOMANAA                1604 bp    DNA     linear   BCT
26-APR-1993
DEFINITION  E.coli manA gene encoding phosphomannose isomerase,
complete cds.
ACCESSION   M15380
VERSION     M15380.1
KEYWORDS    isomerase; mannose; phosphomannose isomerase.
SOURCE      Escherichia coli
  ORGANISM  Escherichia coli
            Bacteria; Proteobacteria; Gammaproteobacteria;
Enterobacteriales;
            Enterobacteriaceae; Escherichia.
REFERENCE   1  (bases 1 to 1604)
  AUTHORS   Miles,J.S. and Guest,J.R.
  TITLE     Nucleotide sequence and transcriptional start point of the
            phosphomannose isomerase gene (manA) of Escherichia coli
  JOURNAL   Gene 32 (1-2), 41-48 (1984)
   PUBMED   6397402
COMMENT     Original source text: E.coli (strain GM242) DNA, clone
pGS57.
FEATURES             Location/Qualifiers
     source          1..1604
                     /organism="Escherichia coli"
                     /mol_type="genomic DNA"
                     /db_xref="taxon:562"
     mRNA            1..1604
                     /product="PMI mRNA"
     gene            392..1567
                     /gene="manA"
     CDS             392..1567
                     /gene="manA"
                     /note="phosphomannose isomerase"
                     /codon_start=1
                     /transl_table=11
                     /protein_id="AAA24109.1"
                     /db_xref="GI:146722"

/translation="MQKLINSVQNYAWGSKTALTELYGMENPSSQPMAELWMGAHPKS

SSRVQNAAGDIVSLRDVIESDKSTLLGEAVAKRFGELPFLFKVLCAAQPLSIQVHPNK

HNSEIGFAKENAAGIPMDAAERNYKDPNHKPELVFALTPFLAMNAFREFSEIVSLLQP

VAGAHPAIAHFLQQPDAERLSELFASLLNMQGEEKSRALAILKSALDSQQGEPWQTIR

LISEFYPEDSGLFSPLLLNVVKLNPGEAMFLFAETPHAYLQGVALEVMANSDNVLRAG

LTPKYIDIPELVANVKFEAKPANQLLTQPVKQGAELDFPIPVDDFAFSLHDLSDKETT

ISQQSAAILFCVEGDATLWKGSQQLQLKPGESAFIAANESPVTVKGHGRLARVYNKL"
BASE COUNT          409 a          391 c          392 g          412 t
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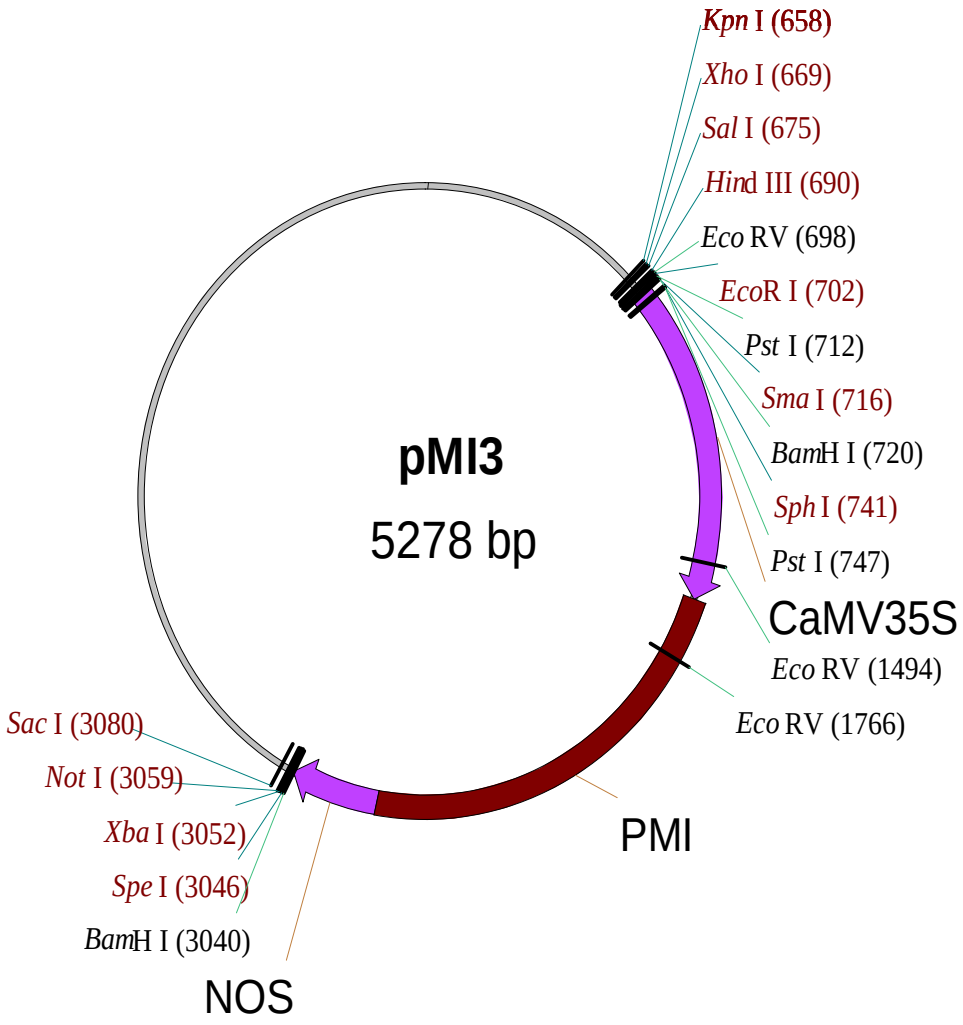
ORIGIN 1 bp upstream of MspI site.

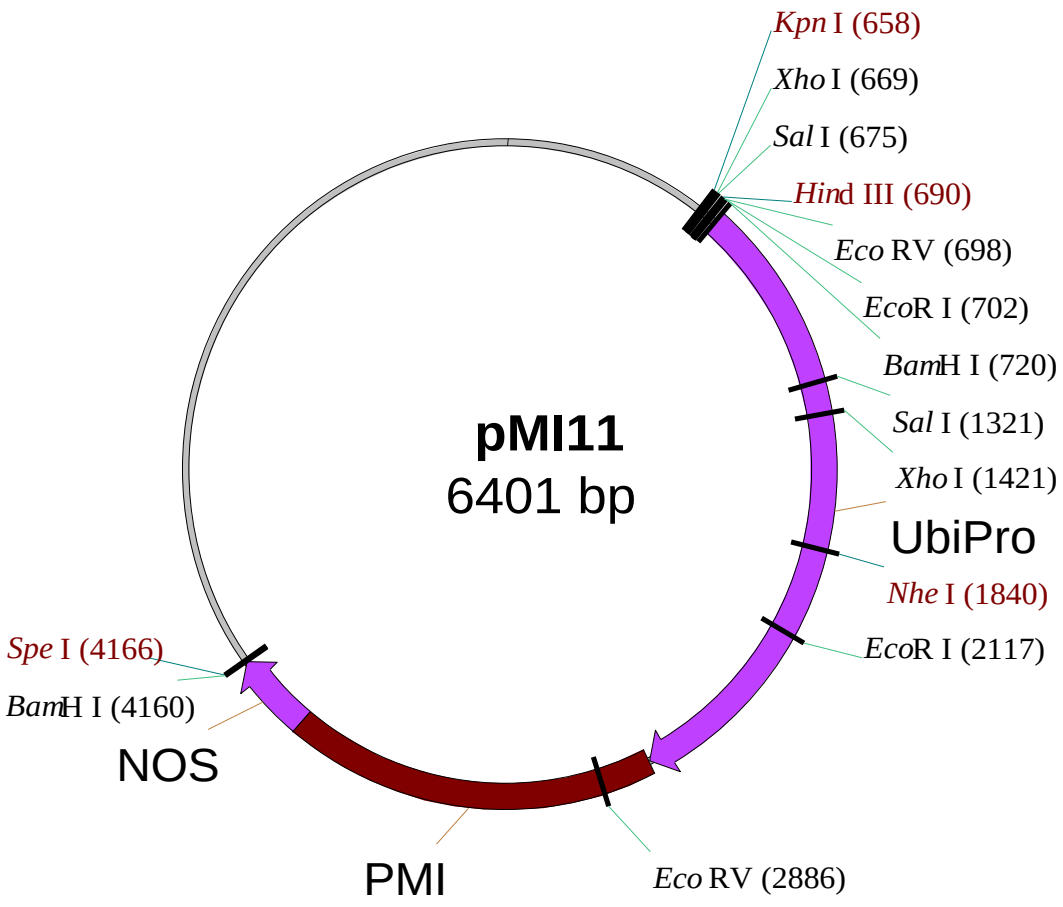
```
        1 ccggacgcag catgaacgac gcatcatgaa acgcctggcg cgccaacaga
gttaacgctt
       61 cgggtgcgac tttcaaaatc tcctgccctt caaattcaga tacgctaacg
tgttcgctgg
      121 ttagcaggta atactcagta tcatcttttt tgagtggaaa aggagcctga
taatgaaagg
      181 gtttgtttga cattgttctc tcacttactg cctggtttgg ttatgctctg
ggcgggtgtt
      241 ccgttgccct gttaaaagcg agtaacaata tcctacacac ttttttaaca
aaaactgaga
      301 ctagtacgac tttttgcggc tccaggttac ttcccgtagg attcttgctt
taatagtggg
      361 attaatttcc acattaaaac agggattgat catgcaaaaa ctcattaact
cagtgcaaaa
      421 ctatgcctgg ggcagcaaaa cggcgttgac tgaactttat ggtatggaaa
atccgtccag
      481 ccagccgatg gccgagctgt ggatgggcgc acatccgaaa agcagttcac
gagtgcagaa
      541 tgccgccgga gatatcgttt cactgcgtga tgtgattgag agtgataaat
cgactctgct
      601 cggagaggcc gttgccaaac gctttggcga actgcctttc ctgttcaaag
tattatgcgc
      661 agcacagcca ctctccattc aggttcatcc aaacaaacac aattctgaaa
tcggttttgc
      721 caaagaaaat gccgcaggta tcccgatgga tgccgccgag cgtaactata
aagatcctaa
      781 ccacaagccg gagctggttt ttgcgctgac gcctttcctt gcgatgaacg
cgtttcgtga
      841 attttccgag attgtctccc tactccagcc ggtcgcaggt gcacatccgg
cgattgctca
      901 ctttttacaa cagcctgatg ccgaacgttt aagcgaactg ttcgccagcc
tgttgaatat
      961 gcagggtgaa gaaaaatccc gcgcgctggc gattttaaaa tcggccctcg
atagccagca
     1021 gggtgaaccg tggcaaacga ttcgtttaat ttctgaattt tacccggaag
acagcggtct
     1081 gttctccccg ctattgctga atgtggtgaa attgaaccct ggcgaagcga
tgttcctgtt
     1141 cgctgaaaca ccgcacgctt acctgcaagg cgtggcgctg gaagtgatgg
caaactccga
     1201 taacgtgctg cgtgcgggtc tgacgcctaa atacattgat attccggaac
tggttgccaa
     1261 tgtgaaattc gaagccaaac cggctaacca gttgttgacc cagccggtga
aacaaggtgc
     1321 agaactggac ttcccgattc cagtggatga ttttgccttc tcgctgcatg
accttagtga
     1381 taaagaaacc accattagcc agcagagtgc cgccattttg ttctgcgtcg
aaggcgatgc
     1441 aacgttgtgg aaaggttctc agcagttaca gcttaaaccg ggtgaatcag
cgtttattgc
     1501 cgccaacgaa tcaccggtga ctgtcaaagg ccacggccgt ttagcgcgtg
tttacaacaa
     1561 gctgtaagag cttactgaaa aaattaacat ctcttgctaa gctt
```

Appendix B



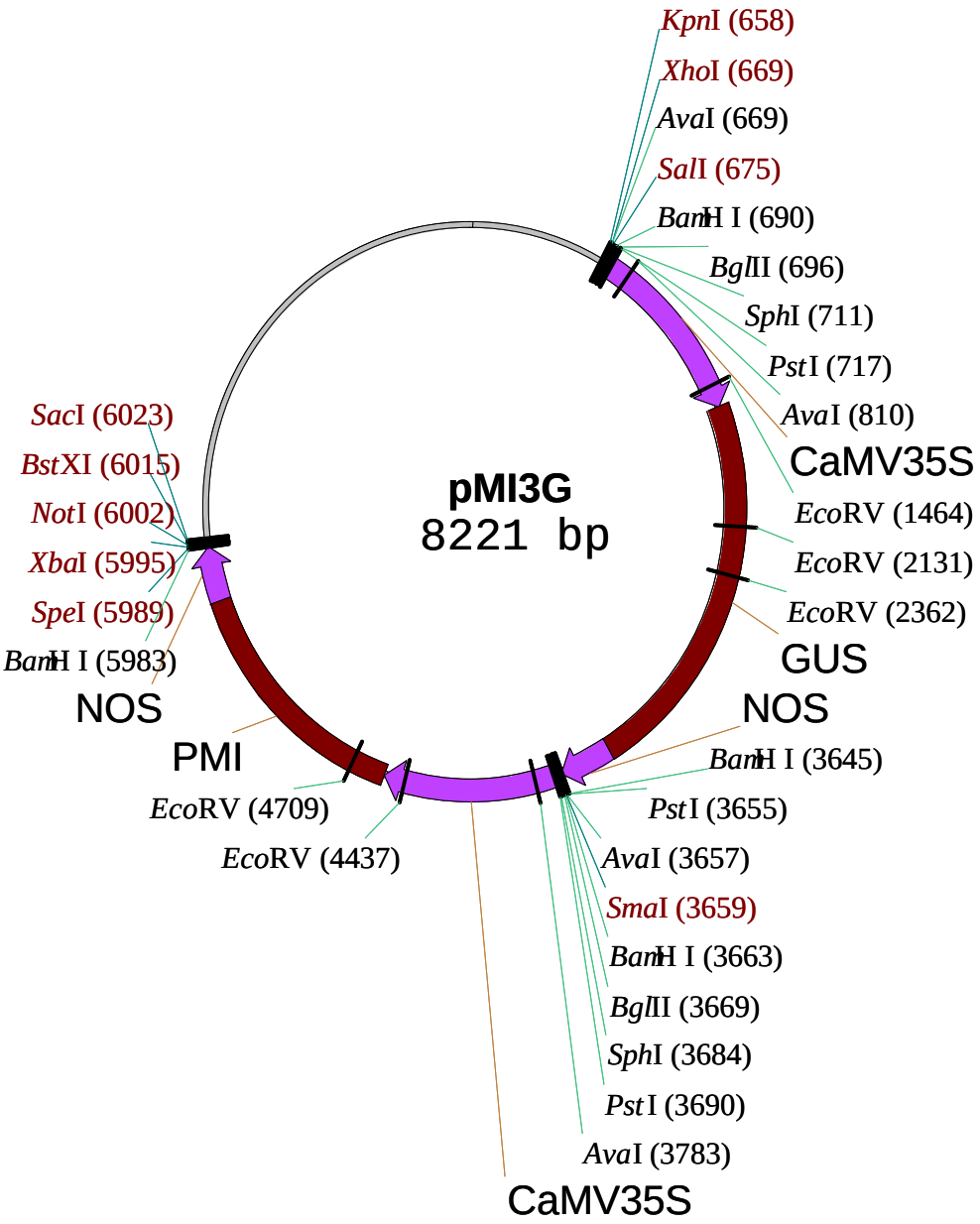
Restriction map of pMI3

Appendix C



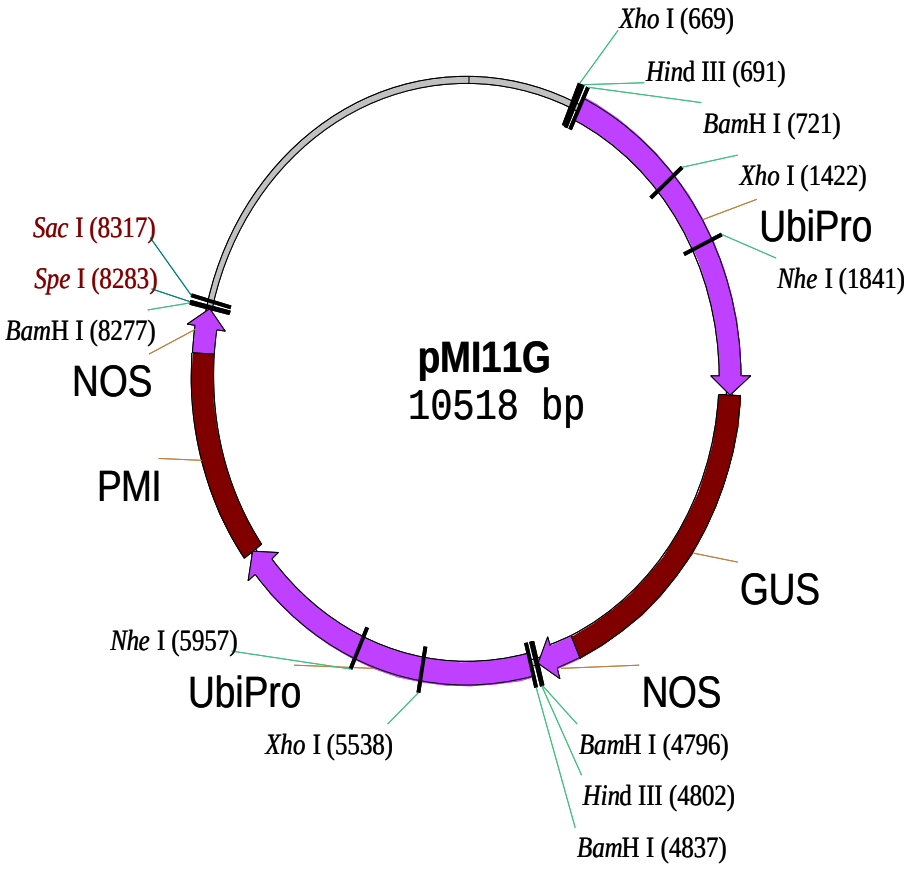
Restriction map of pMI11

Appendix D



Restriction map of pMI3G

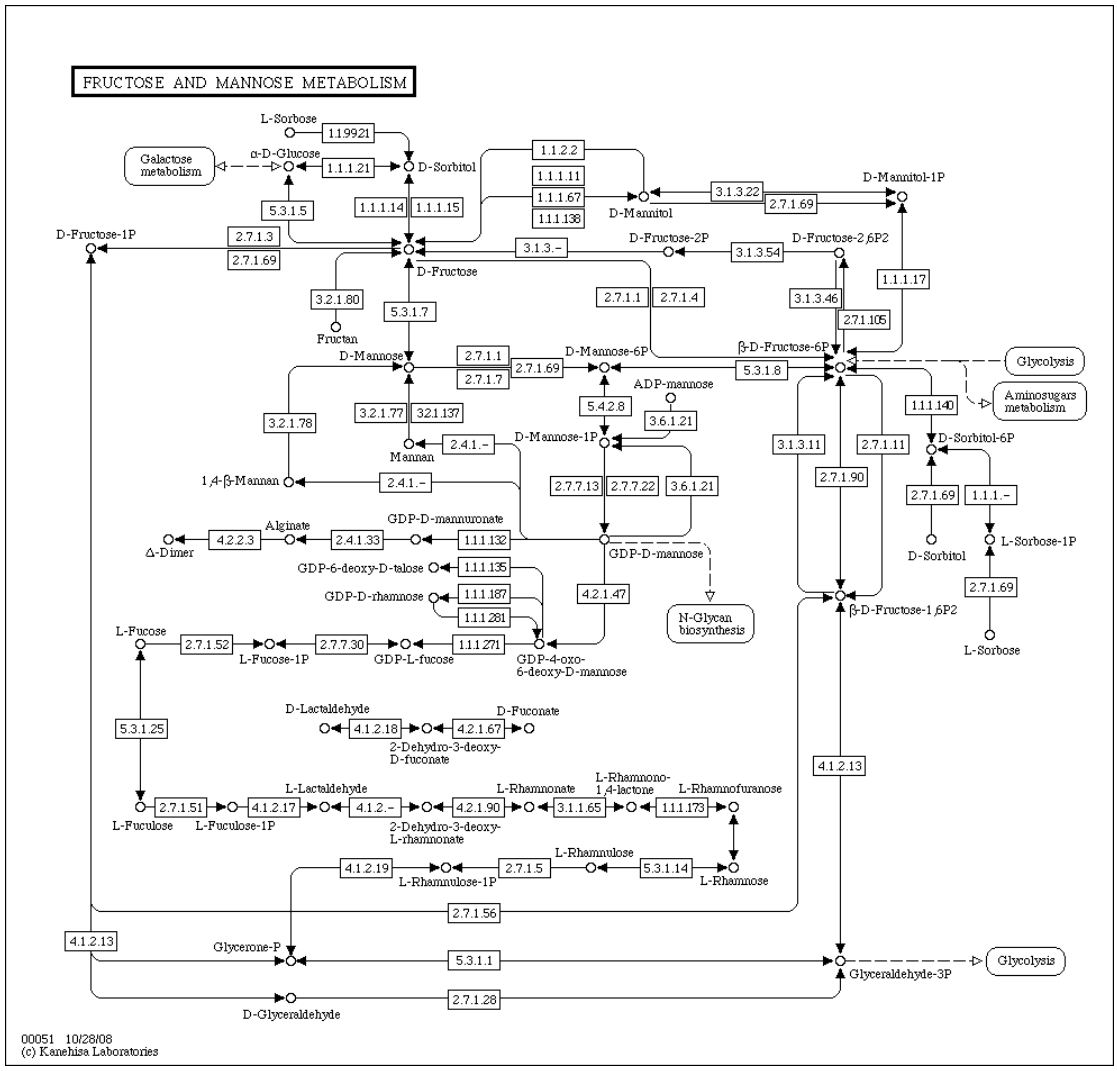
Appendix E



Restriction map of pMI11G

Appendix F

Fructose and mannose metabolism



Appendix G

Effect of mannose on selection and regeneration of oil palm embryogenic calli. EC were cultured for 5 months on different concentrations selection medium and 30 g/l sucrose used as a control.

No.	Man:Suc (g/l)	Average fresh weight (g) in 5 months						% proliferation
		0	1	2	3	4	5	
1	0:30	0.54	2.48 ± 0.08	13.04 ± 0.50	47.98 ± 0.16	100.26 ± 0.58	154.45 ± 0.29	100
2	5:25	0.56	2.21 ± 0.08	11.09 ± 0.18	31.39 ± 0.41	77.60 ± 0.47	130.51 ± 0.26	84.43
3	10:20	0.54	2.25 ± 0.15	11.71 ± 0.35	49.80 ± 0.28	84.75 ± 0.28	101.13 ± 0.32	65.36
4	15:15	0.57	2.08 ± 0.24	11.34 ± 0.49	44.81 ± 1.52	75.43 ± 1.71	126.03 ± 3.70	81.52
5	20:10	0.56	2.82 ± 0.18	8.10 ± 0.23	26.81 ± 0.49	66.71 ± 0.97	111.48 ± 4.00	72.07
6	25:5	0.56	2.58 ± 0.16	11.08 ± 0.41	49.35 ± 1.08	79.31 ± 0.50	107.12 ± 2.90	69.24
7	30:0	0.53	2.38 ± 0.09	12.42 ± 1.19	43.35 ± 1.83	72.26 ± 2.10	98.46 ± 0.97	63.63

Values represent the mean ± S.E. of five replications.

LIST OF PUBLICATIONS

NATIONAL PROCEEDINGS

1. Bahariah, B., Parveez, G. K. A., Norzulaani, K and Rofina, Y. O. (2009). The use of a non-antibiotic selection system, phosphomannose isomerase in oil palm transformation. In 34th Annual Conference of the MSBMB held in Kuala Lumpur, 7-8 October 2009, pp 82.

2. Bahariah, B., Parveez, G. K. A., Norzulaani, K and Rofina, Y. O. (2009). Phosphomannose isomerase as an alternative selectable marker gene for oil palm transformation. In 2009 PIPOC International Palm Oil Congress, Kuala Lumpur, 9-15 November 2009, pp 1254-1266.