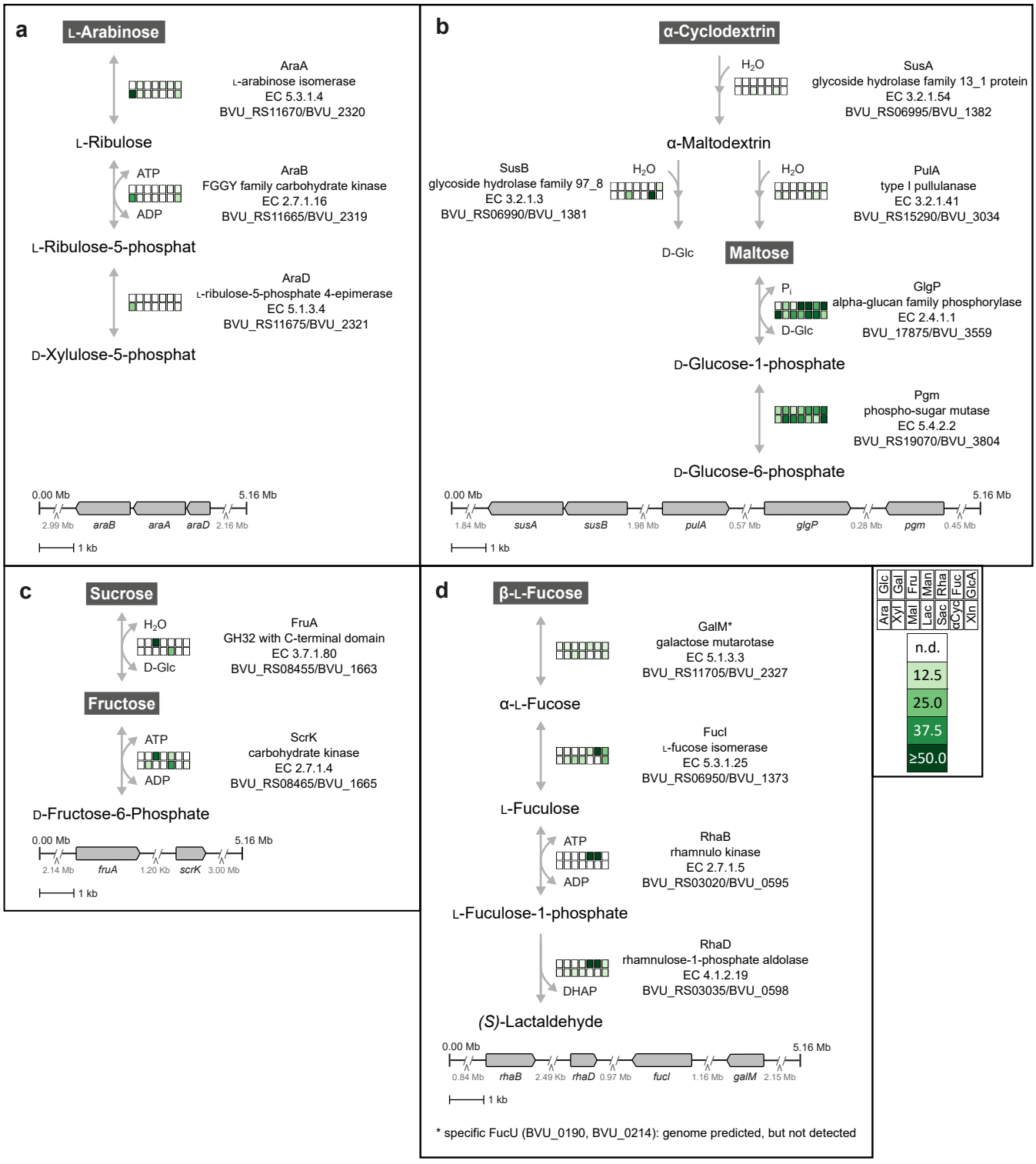
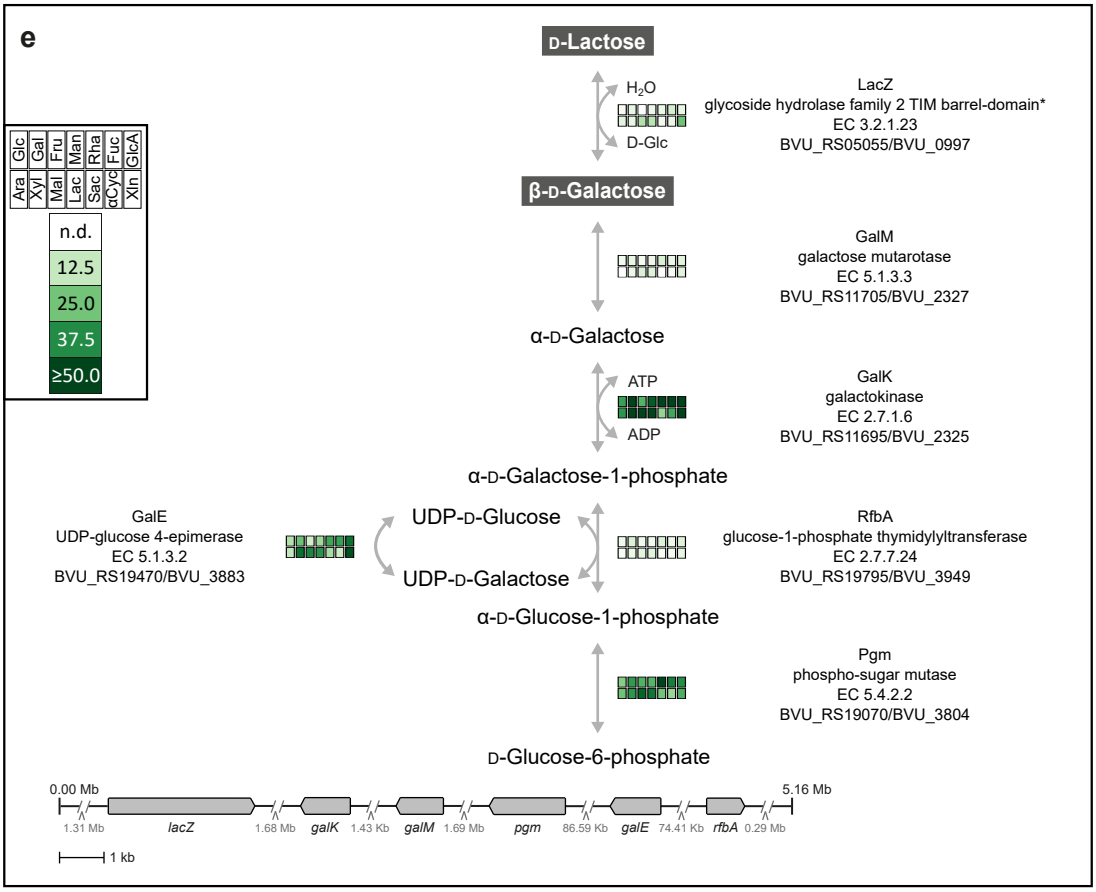
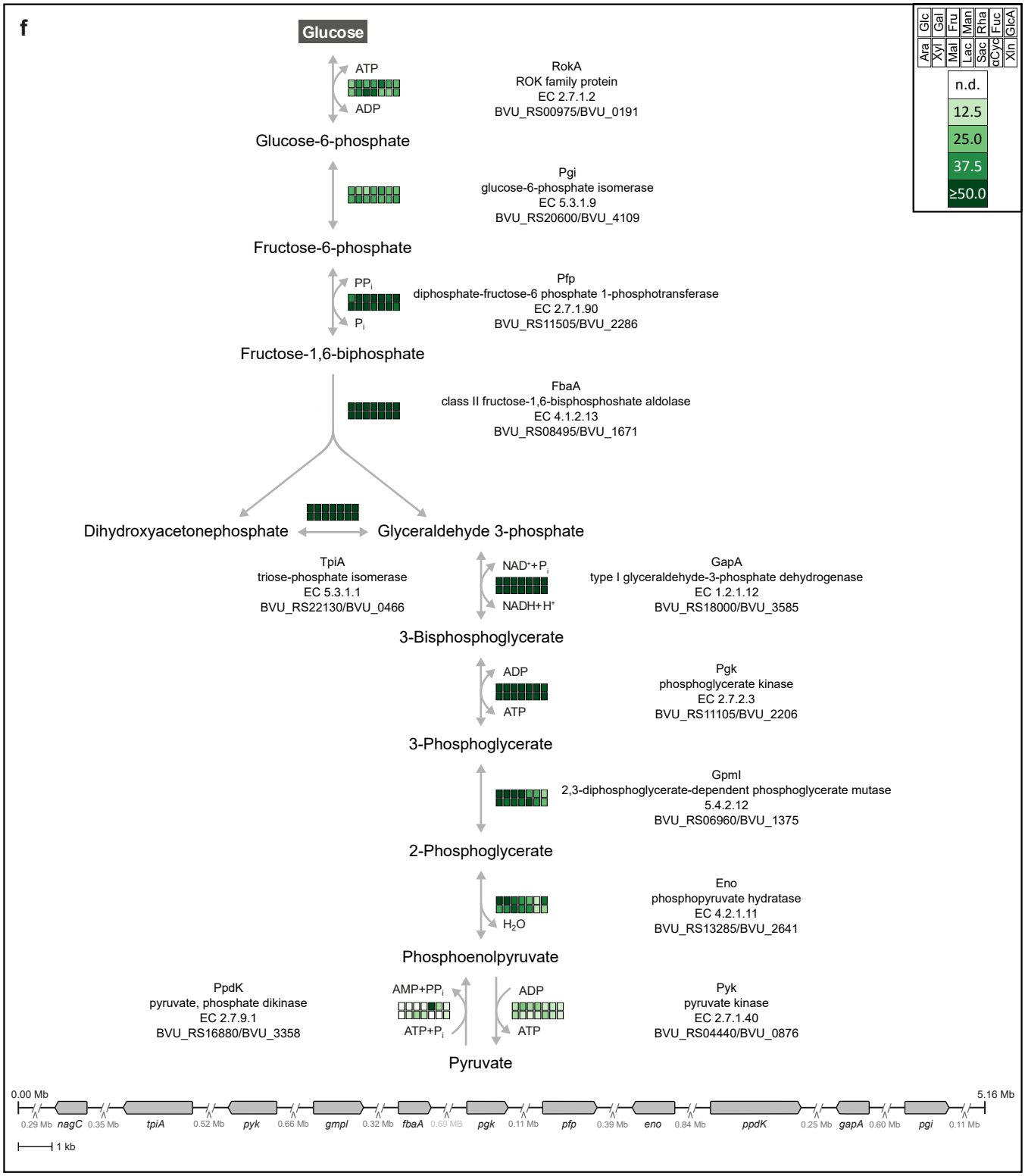
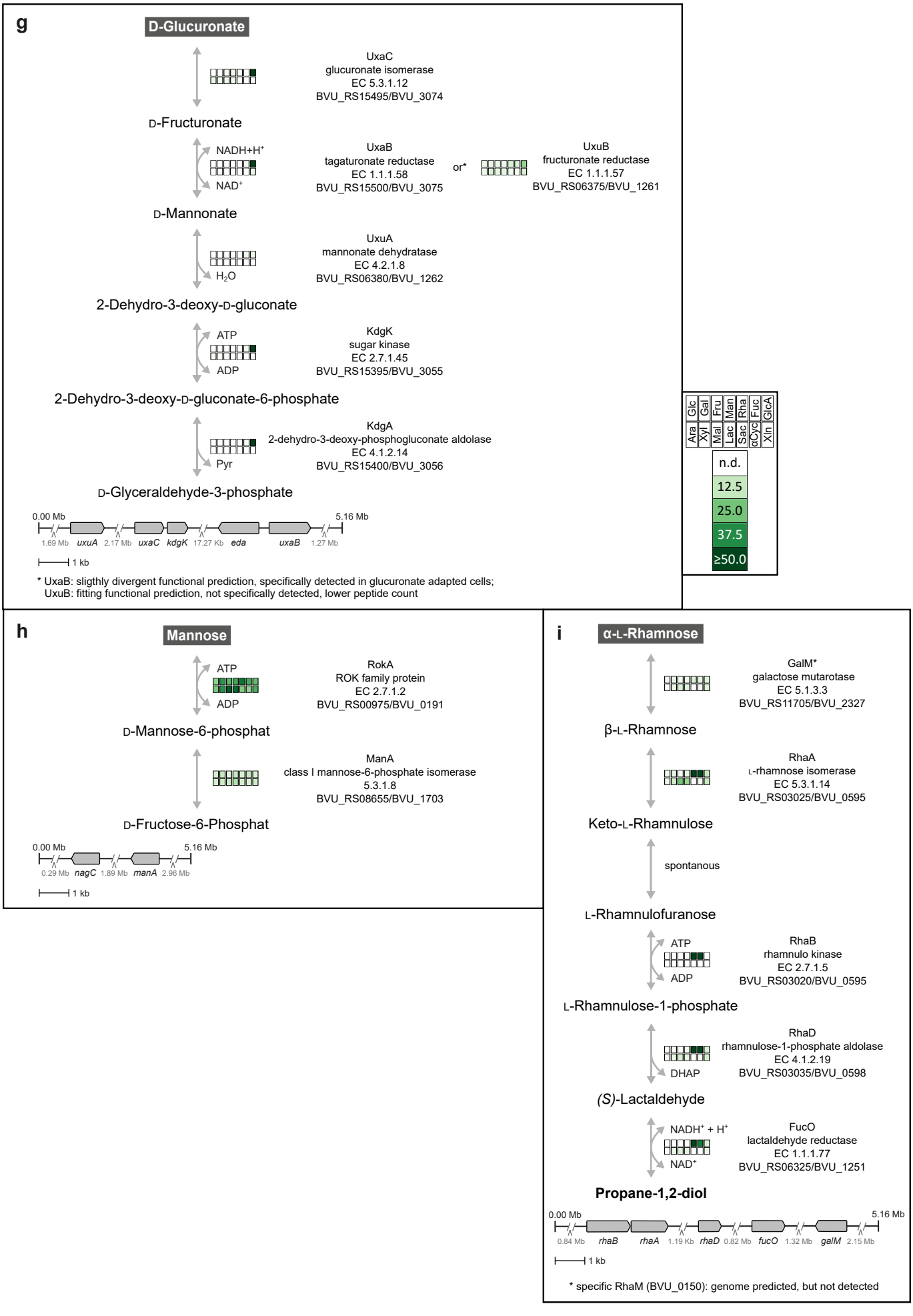
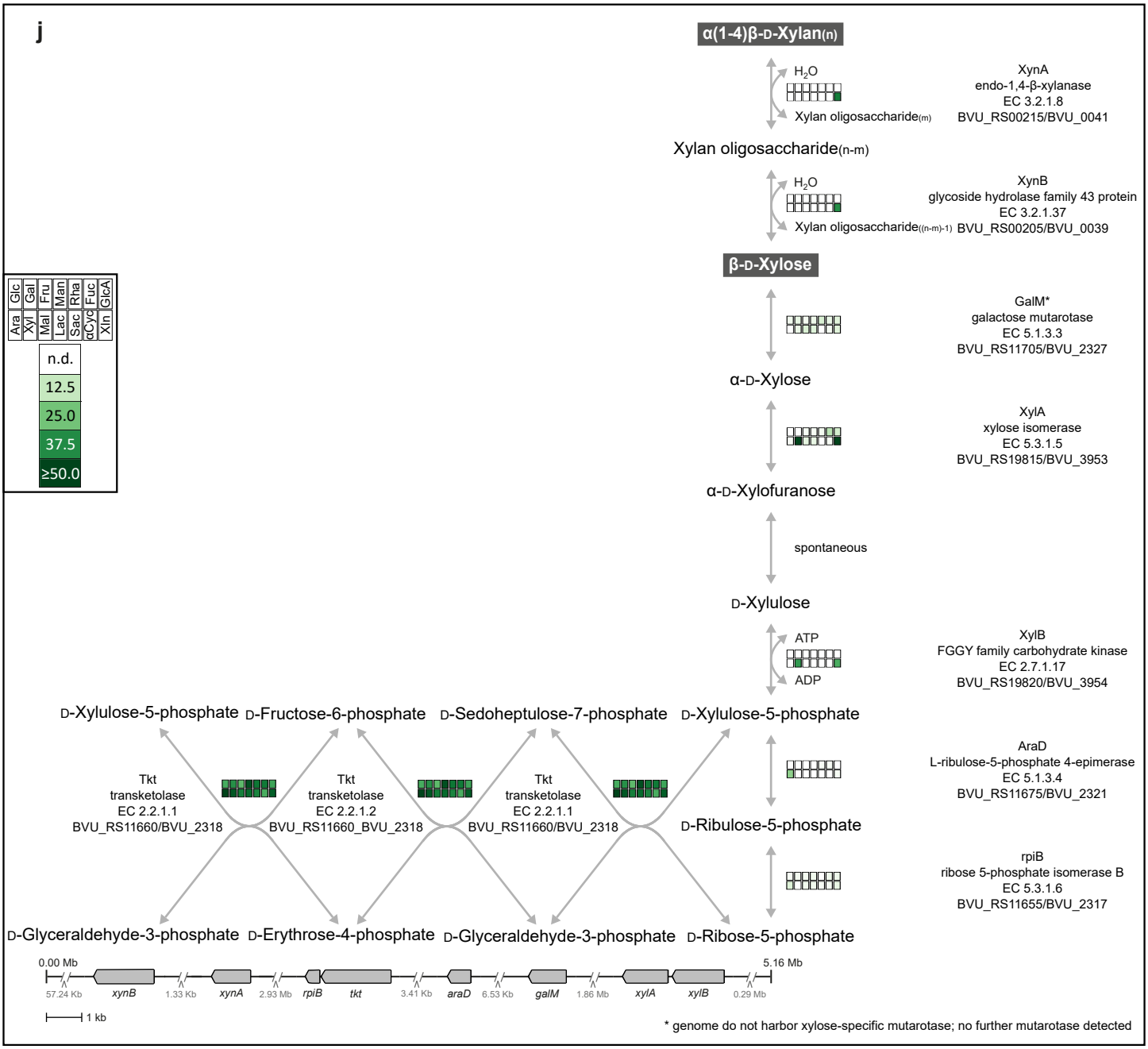
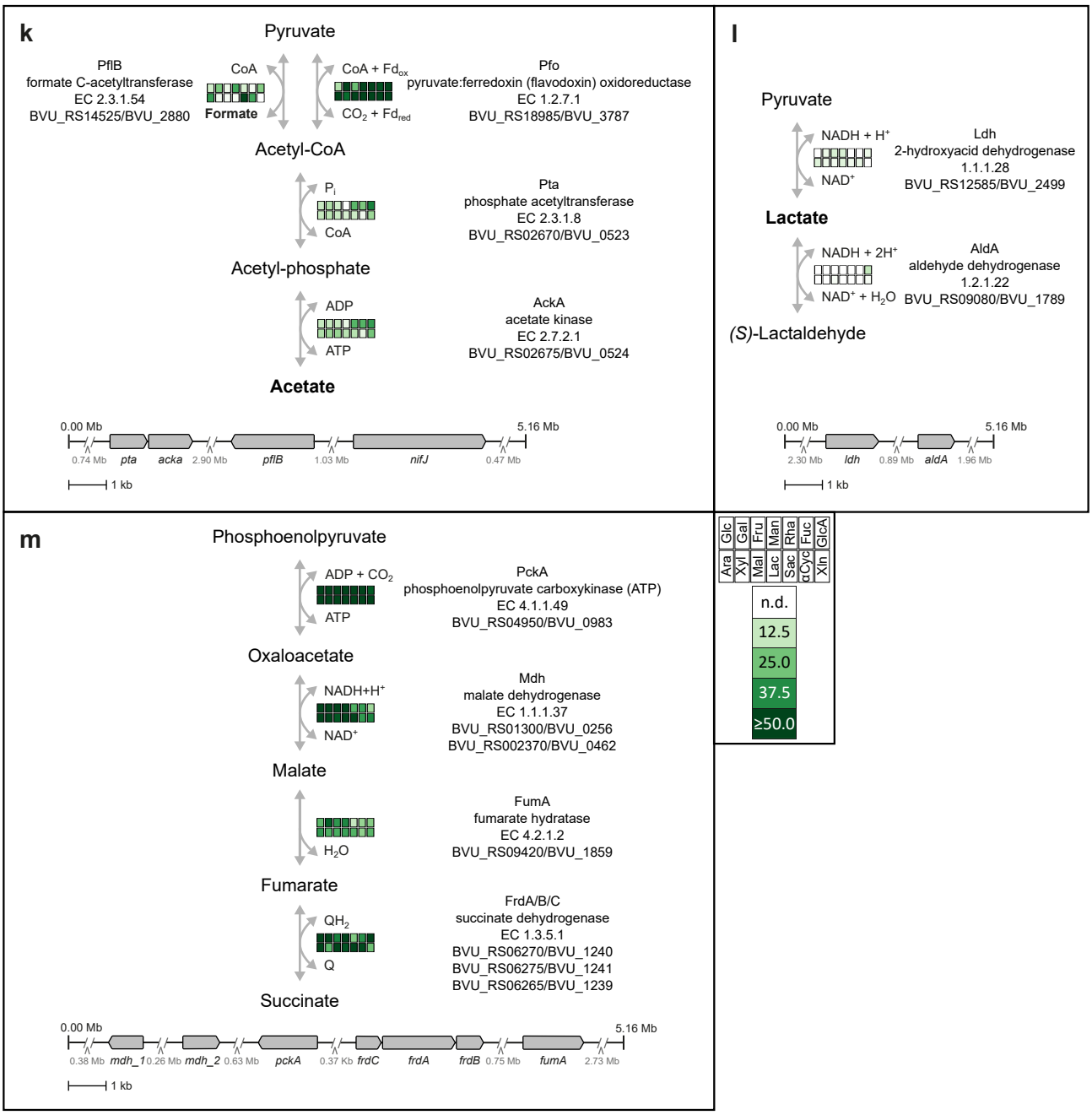

a
L-Arabinose
AraA
L-arabinose isomerase
EC 5.3.1.4
BVU_RS11670/BVU_2320
L-Ribulose
ATP
ADP
AraB
FGGY family carbohydrate kinase
EC 2.7.1.16
BVU_RS11665/BVU_2319
L-Ribulose-5-phosphat
AraD
L-ribulose-5-phosphate 4-epimerase
EC 5.1.3.4
BVU_RS11675/BVU_2321
D-Xylulose-5-phosphat
0.00 Mb
5.16 Mb
2.99 Mb
araB
araA
araD
2.16 Mb
1 kb
b
α-Cyclodextrin
H2O
SusA
glycoside hydrolase family 13_1 protein
EC 3.2.1.54
BVU_RS06995/BVU_1382
α-Maltodextrin
SusB
glycoside hydrolase family 97_8
EC 3.2.1.3
BVU_RS06990/BVU_1381
H2O
H2O
PulA
type I pullulanase
EC 3.2.1.41
BVU_RS15290/BVU_3034
D-Glc
Maltose
Pi
D-Glc
GlgP
alpha-glucan family phosphorylase
EC 2.4.1.1
BVU_17875/BVU_3559
D-Glucose-1-phosphate
Pgm
phospho-sugar mutase
EC 5.4.2.2
BVU_RS19070/BVU_3804
D-Glucose-6-phosphate
0.00 Mb
5.16 Mb
1.84 Mb
susA
susB
1.98 Mb
pulA
0.57 Mb
glgP
0.28 Mb
pgm
0.45 Mb
1 kb
c
Sucrose
H2O
D-Glc
FruA
GH32 with C-terminal domain
EC 3.7.1.80
BVU_RS08455/BVU_1663
Fructose
ATP
ADP
ScrK
carbohydrate kinase
EC 2.7.1.4
BVU_RS08465/BVU_1665
D-Fructose-6-Phosphate
0.00 Mb
5.16 Mb
2.14 Mb
fruA
1.20 Kb
scrK
3.00 Mb
1 kb
d
β-L-Fucose
GalM*
galactose mutarotase
EC 5.1.3.3
BVU_RS11705/BVU_2327
α-L-Fucose
FucI
L-fucose isomerase
EC 5.3.1.25
BVU_RS06950/BVU_1373
L-Fuculose
ATP
ADP
RhaB
rhamnulo kinase
EC 2.7.1.5
BVU_RS03020/BVU_0595
L-Fuculose-1-phosphate
DHAP
RhaD
rhamnulose-1-phosphate aldolase
EC 4.1.2.19
BVU_RS03035/BVU_0598
(S)-Lactaldehyde
0.00 Mb
5.16 Mb
0.84 Mb
rhaB
2.49 Kb
rhaD
0.97 Mb
fucI
1.16 Mb
galM
2.15 Mb
1 kb
* specific FucU (BVU_0190, BVU_0214): genome predicted, but not detected
Glc
Gal
Fru
Man
Rha
Fuc
GlcA
Ara
Xyl
Mal
Lac
Sac
αCyc
Xln
n.d.
12.5
25.0
37.5
≥50.0


e
Glc
Gal
Fru
Man
Rha
Fuc
GlcA
Ara
Xyl
Mal
Lac
Sac
αCyc
Xln
n.d.
12.5
25.0
37.5
≥50.0
D-Lactose
H2O
D-Glc
LacZ
glycoside hydrolase family 2 TIM barrel-domain*
EC 3.2.1.23
BVU_RS05055/BVU_0997
β-D-Galactose
GalM
galactose mutarotase
EC 5.1.3.3
BVU_RS11705/BVU_2327
α-D-Galactose
ATP
ADP
GalK
galactokinase
EC 2.7.1.6
BVU_RS11695/BVU_2325
α-D-Galactose-1-phosphate
GalE
UDP-glucose 4-epimerase
EC 5.1.3.2
BVU_RS19470/BVU_3883
UDP-D-Glucose
UDP-D-Galactose
RfbA
glucose-1-phosphate thymidylyltransferase
EC 2.7.7.24
BVU_RS19795/BVU_3949
α-D-Glucose-1-phosphate
Pgm
phospho-sugar mutase
EC 5.4.2.2
BVU_RS19070/BVU_3804
D-Glucose-6-phosphate
0.00 Mb
5.16 Mb
1.31 Mb
lacZ
1.68 Mb
galK
1.43 Kb
galM
1.69 Mb
pgm
86.59 Kb
galE
74.41 Kb
rfbA
0.29 Mb
1 kb


f
Glucose
ATP
ADP
Glucose-6-phosphate
RokA
ROK family protein
EC 2.7.1.2
BVU_RS00975/BVU_0191
Pgi
glucose-6-phosphate isomerase
EC 5.3.1.9
BVU_RS20600/BVU_4109
Fructose-6-phosphate
PPi
Pi
Pfp
diphosphate-fructose-6 phosphate 1-phosphotransferase
EC 2.7.1.90
BVU_RS11505/BVU_2286
Fructose-1,6-biphosphate
FbaA
class II fructose-1,6-bisphosphoshate aldolase
EC 4.1.2.13
BVU_RS08495/BVU_1671
Dihydroxyacetonephosphate
Glyceraldehyde 3-phosphate
TpiA
triose-phosphate isomerase
EC 5.3.1.1
BVU_RS22130/BVU_0466
NAD+Pi
NADH+H+
GapA
type I glyceraldehyde-3-phosphate dehydrogenase
EC 1.2.1.12
BVU_RS18000/BVU_3585
3-Bisphosphoglycerate
ADP
ATP
Pgk
phosphoglycerate kinase
EC 2.7.2.3
BVU_RS11105/BVU_2206
3-Phosphoglycerate
GpmI
2,3-diphosphoglycerate-dependent phosphoglycerate mutase
5.4.2.12
BVU_RS06960/BVU_1375
2-Phosphoglycerate
H2O
Eno
phosphopyruvate hydratase
EC 4.2.1.11
BVU_RS13285/BVU_2641
Phosphoenolpyruvate
PpdK
pyruvate, phosphate dikinase
EC 2.7.9.1
BVU_RS16880/BVU_3358
AMP+PPi
ATP+Pi
ADP
ATP
Pyk
pyruvate kinase
EC 2.7.1.40
BVU_RS04440/BVU_0876
Pyruvate
Glc
Gal
Fru
Man
Rha
Fuc
GlcA
Ara
Xyl
Mal
Lac
Sac
αCyc
Xln
n.d.
12.5
25.0
37.5
≥50.0
0.00 Mb
5.16 Mb
0.29 Mb nagC 0.35 Mb tpiA 0.52 Mb pyk 0.66 Mb gmpI 0.32 Mb fbaA 0.69 MB pgk 0.11 Mb pfp 0.39 Mb eno 0.84 Mb ppdK 0.25 Mb gapA 0.60 Mb pgi 0.11 Mb
1 kb


g
D-Glucuronate
UxaC
glucuronate isomerase
EC 5.3.1.12
BVU_RS15495/BVU_3074
D-Fructuronate
NADH+H+
NAD+
UxaB
tagaturonate reductase
EC 1.1.1.58
BVU_RS15500/BVU_3075
or*
UxuB
fructuronate reductase
EC 1.1.1.57
BVU_RS06375/BVU_1261
D-Mannonate
H2O
UxuA
mannonate dehydratase
EC 4.2.1.8
BVU_RS06380/BVU_1262
2-Dehydro-3-deoxy-D-gluconate
ATP
ADP
KdgK
sugar kinase
EC 2.7.1.45
BVU_RS15395/BVU_3055
2-Dehydro-3-deoxy-D-gluconate-6-phosphate
Pyr
KdgA
2-dehydro-3-deoxy-phosphogluconate aldolase
EC 4.1.2.14
BVU_RS15400/BVU_3056
D-Glyceraldehyde-3-phosphate
0.00 Mb
5.16 Mb
1.69 Mb uxuA 2.17 Mb uxaC kdgK 17.27 Kb eda uxaB 1.27 Mb
1 kb
* UxaB: sligthly divergent functional prediction, specifically detected in glucuronate adapted cells;
UxuB: fitting functional prediction, not specifically detected, lower peptide count
Glc
Gal
Fru
Man
Rha
Fuc
GlcA
Xln
Ara
Xyl
Mal
Lac
Sac
dCyc
n.d.
12.5
25.0
37.5
≥50.0
h
Mannose
ATP
ADP
RokA
ROK family protein
EC 2.7.1.2
BVU_RS00975/BVU_0191
D-Mannose-6-phosphat
ManA
class I mannose-6-phosphate isomerase
5.3.1.8
BVU_RS08655/BVU_1703
D-Fructose-6-Phosphat
0.00 Mb
5.16 Mb
0.29 Mb nagC 1.89 Mb manA 2.96 Mb
1 kb
i
α-L-Rhamnose
GalM*
galactose mutarotase
EC 5.1.3.3
BVU_RS11705/BVU_2327
β-L-Rhamnose
RhaA
L-rhamnose isomerase
EC 5.3.1.14
BVU_RS03025/BVU_0595
Keto-L-Rhamnulose
spontanous
L-Rhamnulofuranose
ATP
ADP
RhaB
rhamnulo kinase
EC 2.7.1.5
BVU_RS03020/BVU_0595
L-Rhamnulose-1-phosphate
DHAP
RhaD
rhamnulose-1-phosphate aldolase
EC 4.1.2.19
BVU_RS03035/BVU_0598
(S)-Lactaldehyde
NADH+ + H+
NAD+
FucO
lactaldehyde reductase
EC 1.1.1.77
BVU_RS06325/BVU_1251
Propane-1,2-diol
0.00 Mb
5.16 Mb
0.84 Mb rhaB rhaA 1.19 Kb rhaD 0.82 Mb fucO 1.32 Mb galM 2.15 Mb
1 kb
* specific RhaM (BVU_0150): genome predicted, but not detected


j
α(1-4)β-D-Xylan(n)
H2O
Xylan oligosaccharide(m)
XynA
endo-1,4-β-xylanase
EC 3.2.1.8
BVU_RS00215/BVU_0041
Xylan oligosaccharide(n-m)
H2O
Xylan oligosaccharide((n-m)-1)
XynB
glycoside hydrolase family 43 protein
EC 3.2.1.37
BVU_RS00205/BVU_0039
β-D-Xylose
GalM*
galactose mutarotase
EC 5.1.3.3
BVU_RS11705/BVU_2327
α-D-Xylose
XylA
xylose isomerase
EC 5.3.1.5
BVU_RS19815/BVU_3953
α-D-Xylofuranose
spontaneous
D-Xylulose
ATP
ADP
XylB
FGGY family carbohydrate kinase
EC 2.7.1.17
BVU_RS19820/BVU_3954
D-Xylulose-5-phosphate
D-Fructose-6-phosphate
D-Sedoheptulose-7-phosphate
D-Xylulose-5-phosphate
Tkt
transketolase
EC 2.2.1.1
BVU_RS11660/BVU_2318
Tkt
transketolase
EC 2.2.1.2
BVU_RS11660_BVU_2318
Tkt
transketolase
EC 2.2.1.1
BVU_RS11660/BVU_2318
AraD
L-ribulose-5-phosphate 4-epimerase
EC 5.1.3.4
BVU_RS11675/BVU_2321
D-Ribulose-5-phosphate
rpiB
ribose 5-phosphate isomerase B
EC 5.3.1.6
BVU_RS11655/BVU_2317
D-Glyceraldehyde-3-phosphate
D-Erythrose-4-phosphate
D-Glyceraldehyde-3-phosphate
D-Ribose-5-phosphate
Ara
Xyl
Mal
Lac
Sac
dCyc
Xln
Glc
Gal
Fru
Man
Rha
Fuc
GlcA
n.d.
12.5
25.0
37.5
≥50.0
0.00 Mb
5.16 Mb
57.24 Kb
xynB
1.33 Kb
xynA
2.93 Mb
rpiB
tkt
3.41 Kb
araD
6.53 Kb
galM
1.86 Mb
xylA
xylB
0.29 Mb
1 kb
* genome do not harbor xylose-specific mutarotase; no further mutarotase detected


k
Pyruvate
PflB
formate C-acetyltransferase
EC 2.3.1.54
BVU_RS14525/BVU_2880
CoA
Formate
CoA + Fdox
CO2 + Fdred
Pfo
pyruvate:ferredoxin (flavodoxin) oxidoreductase
EC 1.2.7.1
BVU_RS18985/BVU_3787
Acetyl-CoA
Pi
CoA
Pta
phosphate acetyltransferase
EC 2.3.1.8
BVU_RS02670/BVU_0523
Acetyl-phosphate
ADP
ATP
AckA
acetate kinase
EC 2.7.2.1
BVU_RS02675/BVU_0524
Acetate
0.00 Mb
5.16 Mb
0.74 Mb pta acka 2.90 Mb pflB 1.03 Mb nifJ 0.47 Mb
1 kb
l
Pyruvate
NADH + H+
NAD+
Ldh
2-hydroxyacid dehydrogenase
1.1.1.28
BVU_RS12585/BVU_2499
Lactate
NADH + 2H+
NAD+ + H2O
AldA
aldehyde dehydrogenase
1.2.1.22
BVU_RS09080/BVU_1789
(S)-Lactaldehyde
0.00 Mb
5.16 Mb
2.30 Mb ldh 0.89 Mb aldA 1.96 Mb
1 kb
m
Phosphoenolpyruvate
ADP + CO2
ATP
PckA
phosphoenolpyruvate carboxykinase (ATP)
EC 4.1.1.49
BVU_RS04950/BVU_0983
Oxaloacetate
NADH+H+
NAD+
Mdh
malate dehydrogenase
EC 1.1.1.37
BVU_RS01300/BVU_0256
BVU_RS002370/BVU_0462
Malate
H2O
FumA
fumarate hydratase
EC 4.2.1.2
BVU_RS09420/BVU_1859
Fumarate
QH2
Q
FrdA/B/C
succinate dehydrogenase
EC 1.3.5.1
BVU_RS06270/BVU_1240
BVU_RS06275/BVU_1241
BVU_RS06265/BVU_1239
Succinate
0.00 Mb
5.16 Mb
0.38 Mb mdh_1 0.26 Mb mdh_2 0.63 Mb pckA 0.37 Kb frdC frdA frdB 0.75 Mb fumA 2.73 Mb
1 kb
Glc
Gal
Fru
Man
Rha
Fuc
GlcA
Ara
Xyl
Mal
Lac
Sac
αCyc
Xln
n.d.
12.5
25.0
37.5
≥50.0

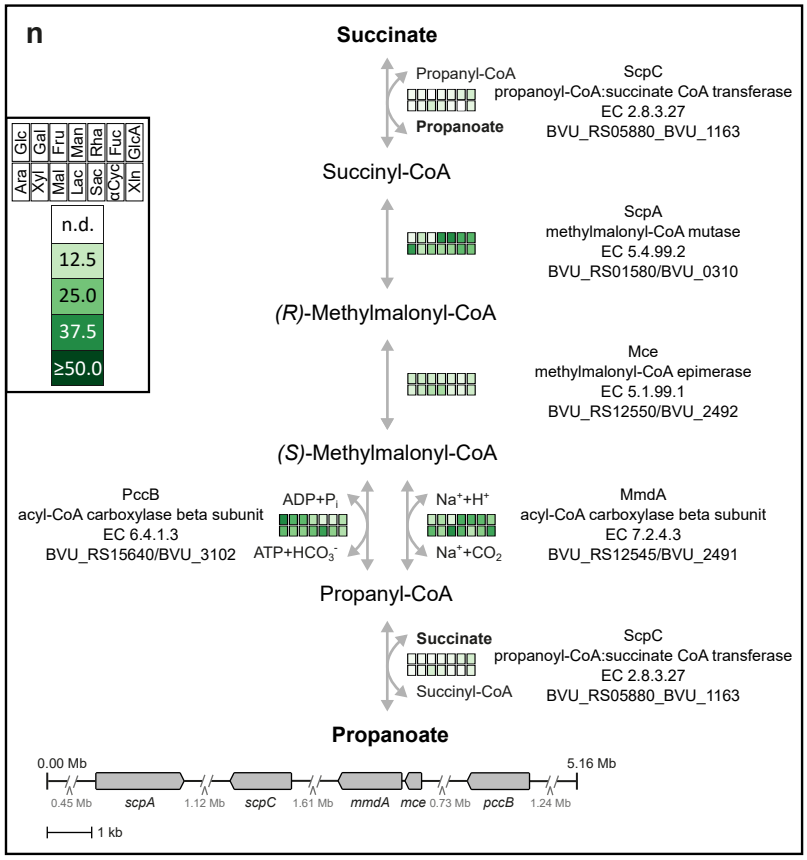


Fig. S2. Substrate-specific and shared details of fermentation network.