

Gene clusters potentially associated with environmental adaptation, bioremediation, biocontrol, and plant-growth promotion in *H. alvei* A23BA

Function	Gene	Product
copper resistance	<i>copC</i>	copper resistance protein
	<i>copD</i>	copper resistance protein
	<i>bco</i>	blue copper oxidase <i>cueO</i> precursor
	<i>cueA</i>	copper-translocating P-type ATPase
	<i>scsA</i>	suppressor for copper sensitivity; copper binding protein
	<i>scsB</i>	suppressor for copper sensitivity; membrane binding protein
	<i>scsC</i>	suppressor for copper sensitivity; secreted protein
	<i>scsD</i>	suppressor for copper sensitivity; membrane protein
	<i>cutA</i>	periplasmic divalent cation tolerance protein
	<i>cutC</i>	cytoplasmic copper homeostasis protein
	<i>cutF</i>	copper homeostasis protein
	<i>cutE</i>	copper homeostasis protein
cobalt-zinc-cadmium resistance	<i>trMer</i>	transcriptional regulator; MerR family
quininate degradation	<i>quiB2</i>	3-dehydroquininate dehydratase II
biphenyl degradation	<i>bphC</i>	biphenyl-2,3-diol 1,2-dioxygenase III-related protein
	<i>bphE1</i>	acetaldehyde dehydrogenase
4-hydroxyphenylacetic acid catabolism	<i>hpaX</i>	4-hydroxyphenylacetate symporter
	<i>hpaA</i>	transcriptional activator of 4-hydroxyphenylacetate 3-monooxygenase operon
	<i>hpaC</i>	4-hydroxyphenylacetate 3-monooxygenase, reductase component
	<i>hpaH</i>	2-oxo-hepta-3-ene-1,7-dioic acid hydratase
	<i>hpaF</i>	5-carboxymethyl-2-hydroxymuconate delta-isomerase
	<i>hpaD</i>	3,4-dihydroxyphenylacetate 2,3-dioxygenase
	<i>hpaE</i>	5-carboxymethyl-2-hydroxymuconate semialdehyde dehydrogenase
	<i>hpaG1</i>	2-hydroxyhepta-2,4-diene-1,7-dioate isomerase
	<i>hpaG2</i>	5-carboxymethyl-2-oxo-hex-3-ene-1,7-dioate decarboxylase
	<i>hpaR</i>	homoprotocatechuate degradative operon repressor
	<i>hpcB</i>	3,4-dihydroxyphenylacetate 2,3-dioxygenase
central meta-cleavage pathway of aromatic compound degradation	<i>hpcH</i>	2-oxo-hepta-3-ene-1,7-dioic acid hydratase
	<i>hpcC</i>	5-carboxymethyl-2-hydroxymuconate semialdehyde dehydrogenase
	<i>hpcD</i>	5-carboxymethyl-2-hydroxymuconate delta-isomerase
	<i>maoA</i>	monoamine oxidase
aromatic amin catabolism	<i>hpcB</i>	3,4-dihydroxyphenylacetate 2,3-dioxygenase
	<i>feaB</i>	phenylacetaldehyde dehydrogenase
	<i>nacb</i>	nitrilotriacetate monooxygenase component B
	<i>hpaC</i>	4-hydroxyphenylacetate 3-monooxygenase, reductase component
	<i>frmA</i>	S-(hydroxymethyl)glutathione dehydrogenase
glutathione-dependent pathway of formaldehyde detoxification	<i>frmB</i>	S-formylglutathione hydrolase
glutathione-dependent xenobiotic degradation	<i>gstO</i>	glutathione S-transferase, omega
	<i>gst</i>	glutathione S-transferase
	<i>gloA</i>	lactoylglutathione lyase
	<i>gloB</i>	hydroxyacylglutathione hydrolase
	<i>sam1</i>	SAM-dependent methyltransferase
	<i>gsr</i>	glutathione reductase
nitrogen metabolism	<i>nir1a</i>	nitrite reductase [NAD(P)H] large subunit
	<i>nir1b</i>	nitrite reductase [NAD(P)H] small subunit
	<i>nirC</i>	nitrite transporter
	<i>narG</i>	respiratory nitrate reductase alpha chain
	<i>narH</i>	respiratory nitrate reductase beta chain
	<i>narI</i>	respiratory nitrate reductase gamma chain

	<i>narJ</i>	respiratory nitrate reductase delta chain
	<i>napB</i>	nitrate reductase cytochrome c550-type subunit
	<i>napC</i>	cytochrome c-type protein NapC
	<i>napF</i>	ferredoxin-type protein NapF
	<i>napG</i>	ferredoxin-type protein NapG (periplasmic nitrate reductase)
	<i>napH</i>	polyferredoxin NapH (periplasmic nitrate reductase)
ferric ion uptake	<i>FhuA</i>	ferric hydroxamate outer membrane receptor
	<i>FhuD</i>	ferric hydroxamate ABC transporter, periplasmic substrate binding protein
	<i>FhuC</i>	ferric hydroxamate ABC transporter, ATP-binding protein
	<i>FhuB</i>	ferric hydroxamate ABC transporter, permease component
plant alkaloid biosynthesis from L-lysine	<i>oxc</i>	oxalyl-CoA decarboxylase
alkanesulfonate assimilation	<i>ssuA</i>	alkanesulfonates-binding protein
	<i>sox</i>	dibenzothiophene desulfurization enzyme
	<i>ars</i>	arylsulfatase
phosphate metabolism	<i>phoU</i>	phosphate transport system regulatory protein
	<i>phoR</i>	phosphate regulon sensor protein
	<i>phoB</i>	phosphate regulon transcriptional regulatory protein
	<i>ppk</i>	polyphosphate kinase
	<i>ppx</i>	exopolyphosphatase
	<i>gdp</i>	guanosine-5'-triphosphate,3'-diphosphate pyrophosphatase
	<i>phoA</i>	alkaline phosphatase
	<i>ppa</i>	inorganic pyrophosphatase
	<i>phoH</i>	phosphate starvation-inducible protein