Supplementary Materials

Genomic and phenotypic analysis reveals taxonomic and biosynthetic diversity in desert-derived *Saccharothrix*

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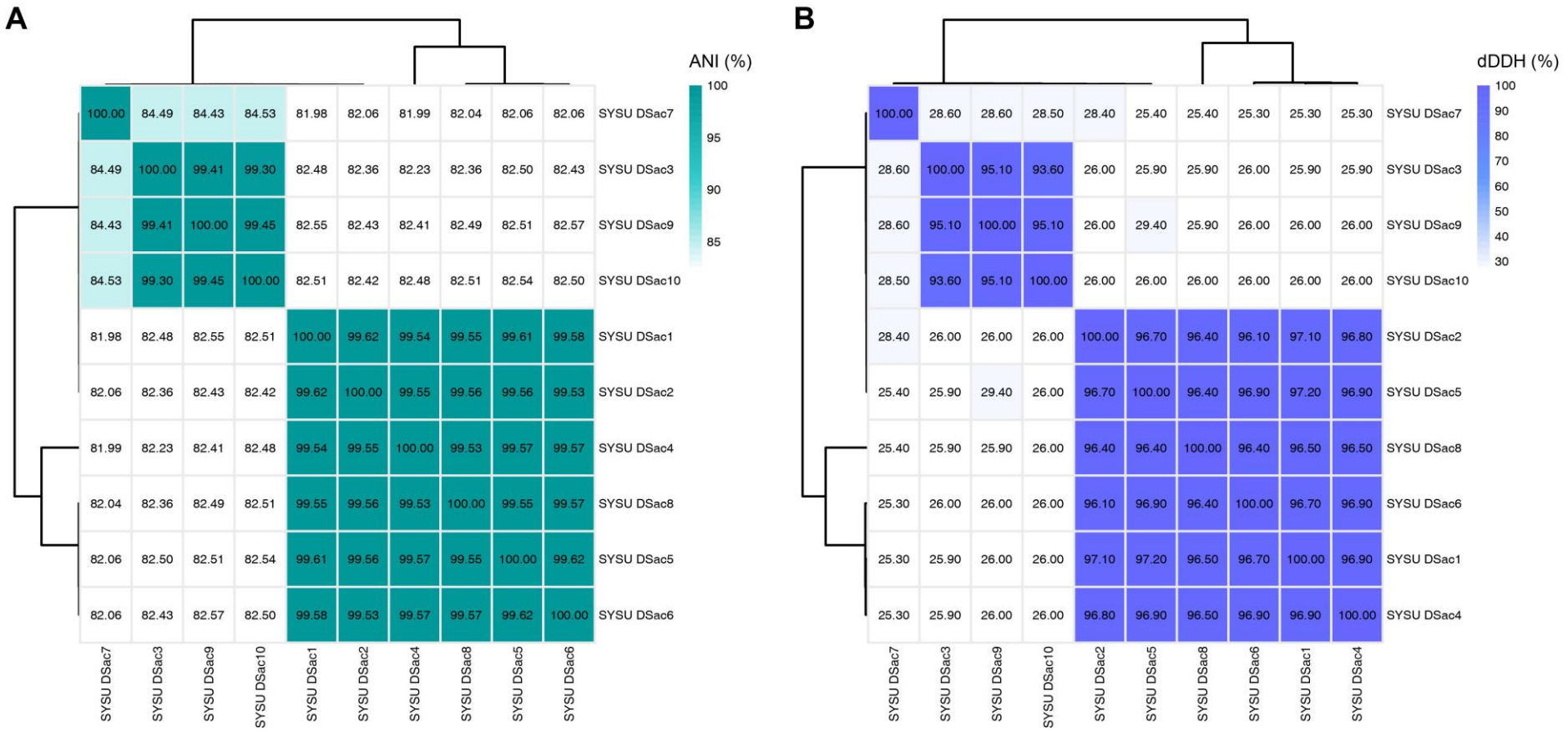


Fig. S1 Pairwise genomic relatedness among the ten *Saccharothrix* isolates based on ANI and dDDH. **A**, ANI values. **B**, dDDH values.

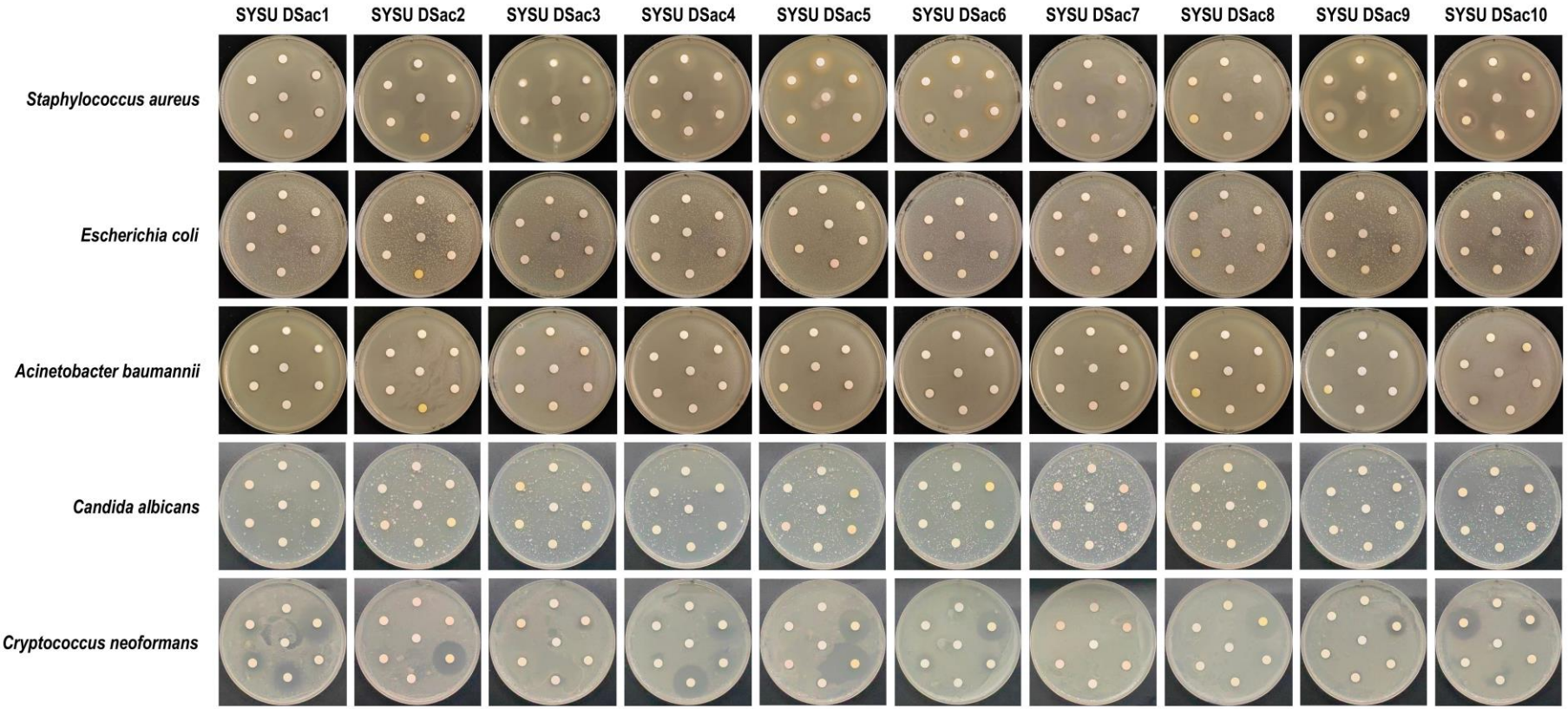


Fig. S2 Original agar plate images from antimicrobial activity screening of ten *Saccharothrix* isolates. The antimicrobial activity of crude extracts obtained from ten *Saccharothrix* isolates cultured in six fermentation media (GV, SGCP, PGSY, SSM, SM13, and SM14) was evaluated against five indicator microorganisms, *Staphylococcus aureus*, *Escherichia coli*, *Acinetobacter baumannii*, *Candida albicans*, and *Cryptococcus neoformans*. Inhibition zones around the disks were used to assess antimicrobial activity. The corresponding results are summarized in Table 3, with "+" indicating detectable inhibition and "–" indicating no detectable inhibition.

Table S1 Composition of fermentation media used for cultivation of *Saccharothrix* strains

Medium	Components (g L^{-1})
M1 (SM13)	glycerol, 25.0; yeast extract, 10.0; beef extract, 10.0; polypeptone, 5.0; NaCl, 2.0; $MgSO_4 \cdot 7H_2O$, 5.0; $CaCO_3$, 3.0; trace salt solution, 1 mL
M2 (SM14)	glycerol, 20.0; dextrin, 20.0; soybean peptone, 10.0; yeast extract, 3.0; $(NH_4)_2SO_4$, 3.0; $CaCO_3$, 3.0; trace salt solution, 1 mL
M3 (SSM)	glucose, 10.0; $(NH_4)_2SO_4$, 2.0; NaCl, 2.0; KH_2PO_4, 0.5; K_2HPO_4, 1.0; $MgSO_4 \cdot 7H_2O$, 2.0; $CaCO_3$, 5.0; yeast extract, 2.0; trace salt solution, 1 mL
M4 (PGSY)	potato starch, 20.0; glucose, 20.0; soybean meal, 20.0; yeast extract, 5.0; NaCl, 2.5; $CaCO_3$, 3.2; trace salt solution, 1 mL
M5 (SGCP)	soluble starch, 10.0; glucose, 25.0; cottonseed meal, 10.0; bacteriological peptone, 3.0; $CaCO_3$, 5.0; K_2HPO_4, 0.1; $MgSO_4 \cdot 7H_2O$, 0.1; NaCl, 5.0; trace salt solution, 1 mL
M6 (GV)	soluble starch, 10.0; glucose, 5.0; casein hydrolysate, 3.0; yeast extract, 2.0; malt extract, 2.0; tryptone, 5.0; K_2HPO_4, 1.0; $MgSO_4 \cdot 7H_2O$, 0.5; $CaCO_3$, 2.0; trace salt solution, 1 mL

Note: The initial pH of all fermentation media was adjusted to 7.5 before sterilization. The trace salt solution contained $CuSO_4 \cdot 5H_2O$, $ZnSO_4 \cdot 7H_2O$, and $MnCl_2 \cdot 4H_2O$ at 0.5 g L^{-1} each.

Table S2 Phenotypic characteristics of the ten desert-derived *Saccharothrix* strains cultivated on different media

Medium	Trait	ISP 1	ISP 2	ISP 3	ISP 4	ISP 5	ISP 6	ISP 7	Bennett	Luedemann	R2A	TSA	MacConky
SYSU DSac1	Growth	Good	Good	Good	Moderate	Good	Moderate	Good	Moderate	Good	Good	Good	–
	Colony color	Pale yellow	Pale yellow	Pale yellow	Pink	Yellow	Pale yellow	Pale yellow	Pale yellow	Pale yellow	White	Pale yellow	–
	Surface	Rough	Rough	Rough	Smooth	Rough	Rough	Rough	Rough	Rough	Smooth	Rough	–
	Diffusible pigment	–	–	–	–	Pink	–	–	–	–	–	–	–
SYSU DSac2	Growth	Good	Good	Good	Poor	Good	Good	Good	Poor	Good	Good	Good	–
	Colony color	Pale yellow	Pale yellow	Pale yellow	Yellow	Yellow	Pale yellow	Pale yellow	Pale yellow	Pale yellow	White	Pale yellow	–
	Surface	Rough	Rough	Rough	Smooth	Rough	Rough	Rough	Rough	Rough	Rough	Rough	–
	Diffusible pigment	–	–	–	–	Pink	–	–	–	–	–	–	–
SYSU DSac3	Growth	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	–
	Colony color	Pale yellow	Pale yellow	White	White	White	Pale yellow	White	Pale yellow	Pale yellow	White	Pale yellow	–
	Surface	Rough	Rough	Rough	Smooth	Smooth	Rough	Smooth	Rough	Rough	Rough	Rough	–
	Diffusible pigment	–	–	–	Pink	Pink	–	Pink	–	Pink	–	–	–
SYSU DSac4	Growth	Good	Good	Good	Poor	Good	Moderate	Good	Moderate	Good	Good	Good	–
	Colony color	Pale yellow	Pale yellow	Yellow	Yellow	Yellow	Pale yellow	Light orange	Pale yellow	Pale yellow	White	Pale yellow	–
	Surface	Rough	Rough	Rough	Smooth	Rough	Rough	Rough	Rough	Rough	Rough	Rough	–
	Diffusible pigment	–	–	–	–	Pink	–	–	–	–	–	–	–
SYSU DSac5	Growth	Good	Good	Good	Moderate	Good	Good	Good	Moderate	Good	Good	Good	–
	Colony color	Light yellow	White	Light yellow	Yellow	White	Light yellow	Light yellow	Light yellow	Light yellow	White	Light yellow	–
	Surface	Rough	Rough	Smooth	Smooth	Smooth	Rough	Smooth	Rough	Rough	Rough	Smooth	–
	Diffusible pigment	–	–	–	–	–	–	–	–	–	–	–	–

Medium	Trait	ISP 1	ISP 2	ISP 3	ISP 4	ISP 5	ISP 6	ISP 7	Bennett	Luedemann	R2A	TSA	MacConky
SYSU DSac6	Growth	Good	Moderate	Good	Poor	Good	Moderate	Good	Moderate	Good	Good	Good	–
	Colony color	Light yellow	White	Light yellow	Yellow	White	Light yellow	White	Light yellow	Light yellow	White	Light yellow	–
	Surface	Rough	Rough	Smooth	Smooth	Smooth	Rough	Smooth	Rough	Rough	Rough	Smooth	–
	Diffusible pigment	–	–	–	–	–	–	–	–	–	–	–	–
SYSU DSac7	Growth	Good	Good	Good	Good	Good	Moderate	Good	Good	Good	Good	Good	–
	Colony color	Light orange	Light orange	White	Orange-pink	White	Light yellow	White	Pink	Orange-pink	White	Orange-pink	–
	Surface	Rough	Rough	Smooth	Smooth	Smooth	Rough	Smooth	Rough	Rough	Rough	Smooth	–
	Diffusible pigment	–	–	–	–	–	–	–	–	–	–	–	–
SYSU DSac8	Growth	Good	Moderate	Good	Poor	Moderate	Poor	Good	Moderate	Good	Good	Good	–
	Colony color	Light yellow	White	Light yellow	Yellow	White	Light yellow	White	Light yellow	Light yellow	White	White	–
	Surface	Rough	Rough	Rough	Smooth	Smooth	Rough	Smooth	Smooth	Rough	Smooth	Rough	–
	Diffusible pigment	–	–	–	–	–	–	–	–	–	–	–	–
SYSU DSac9	Growth	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	–
	Colony color	Light yellow	White	White	White	White	Light yellow	White	Light yellow	Light yellow	White	Light yellow	–
	Surface	Rough	Rough	Smooth	Smooth	Smooth	Rough	Smooth	Rough	Smooth	Smooth	Rough	–
	Diffusible pigment	–	–	Pink	Pink	Pink	Pink	Pink	Pink	Pink	–	–	–
SYSU DSac10	Growth	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	–
	Colony color	White	White	White	White	White	Light yellow	White	Light yellow	Light yellow	White	Light yellow	–
	Surface	Rough	Rough	Smooth	Smooth	Smooth	Rough	Smooth	Rough	Smooth	Smooth	Rough	–
	Diffusible pigment	–	–	Pink	Pink	Pink	Pink	Pink	Pink	Pink	Pink	–	–

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Table S3 Physiological and enzymatic characteristics of the ten desert-derived *Saccharothrix* strains

Characteristic	SYSU DSac1	SYSU DSac2	SYSU DSac3	SYSU DSac4	SYSU DSac5	SYSU DSac6	SYSU DSac7	SYSU DSac8	SYSU DSac9	SYSU DSac10
Temperature range (°C)	28−45	15−50	28−50	28−55	28−45	15−50	15−55	15−50	15−55	15−55
NaCl tolerance (%)	0−2.0	0−2.0	0−2.5	0−3.0	0−1.0	0−1.0	0−3.0	0−2.5	0−4.0	0−3.5
pH range for growth	6.0−8.0	6.0−8.0	6.0−9.0	6.0−8.0	6.0−8.0	6.0−8.0	6.0−9.0	6.0−8.0	6.0−9.0	6.0−9.0
Hydrolysis of:										
Starch	−	+	+	w	w	−	w	w	+	+
Cellulose	+	+	+	+	+	+	+	+	+	+
Casein	+	+	w	+	+	−	−	+	w	−
Lignin	w	+	w	w	w	+	+	+	+	+
Tween 20	+	+	−	−	−	+	+	+	+	+
Tween 40	+	+	+	+	+	+	+	+	+	+
Tween 60	+	+	+	+	+	+	+	+	+	+
Tween 80	+	+	+	+	+	+	+	+	+	+
Nitrogen fixation	w	w	w	−	−	−	w	w	w	w
Potassium removal	−	−	−	−	−	−	−	−	−	−
Organic phosphate solubilization	−	−	−	−	−	−	−	−	−	−
Inorganic phosphate solubilization	−	−	−	−	−	−	−	−	−	−