Synthetic Zippers as an Enabling Tool for Engineering of Non-Ribosomal Peptide Synthetases

Kenan A. J. Bozhueyuek^{1,4}, Jonas Watzel^{1,4}, Nadya Abbood^{1,4}, Helge B. Bode^{1,2,3*}

- 1 Molecular Biotechnology, Department of Biosciences, Goethe University Frankfurt, 60438, Frankfurt am Main, Germany.
- 2 Buchmann Institute for Molecular Life Sciences (BMLS), Goethe University Frankfurt, 60438, Frankfurt am Main, Germany.
- 3 Senckenberg Gesellschaft für Naturforschung, 60325, Frankfurt am Main, Germany
- 4 equal contribution
- * Corresponding author

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1 Material and methods

1.1 Cultivation of strains

All *E. coli* DH10B::*mtaA*, *Xenorhabdus szentirmaii, Xenorhabdus nematophila* and *Photorhabdus luminescens* cells were cultivated in liquid or on solid LB-medium (pH 7.5, 10 g/L tryptone, 5 g/L yeast extract and 5 g/L NaCl). Solid media contained 1% (w/v) agar. Kanamycin (50 μ g/ml), chloramphenicol (34 μ g/ml) and spectinomycin (50 μ g/ml) were used as selection markers. All *E. coli* cells cultures were cultivated at 37 °C and at 22 °C for peptide production purposes. *Xenorhabdus* and *Photorhabdus* strains were grown at 30 °C.

1.2 Cloning of biosynthetic gene clusters

Genomic DNA of selected Xenorhabdus and Photorhabdus strains were isolated using the Qiagen Gentra Puregene Yeast/Bact Kit. All PCRs were performed with oligonucleotides obtained from Eurofins Genomics (Supplementary Table 4). NRPS fragments for Hot Fusion cloning (1) were amplified with primers coding for the respective homology arms (20-30 bp) in a two-step PCR program. The coding sequences for the SYNZIPs were also attached upstream or downstream to the NRPS genes by PCR. In the following, the cloning procedure for the basic vectors is explained. pJW61/62 was obtained by the following steps: First, the SYNZIP17/18 coding sequences (pENTR-SYNZIP17/18 (2) were a gift from Amy Keating, Addgene plasmids #80671/80672; RRID:Addgene_80671/80672) were inserted into the plasmids pCOLA_ara/tacl and pCK_0402 by oligonucleotides KB-pACYC-FW/RV or KB-pCOLA-FW/RV in two-step polymerase chain reactions (PCRs) combined with Hot Fusion Cloning (1). Second, these plasmids were linearized by single-step PCRs with the help of the oligonucleotides KB-pCOLA-II-FW/RV or KB-pACYC-II-FW/RV, which further allowed us to introduce NRPS fragments by Hot Fusion cloning. Therefore, the respective NRPS coding sequences were amplified again in two-step PCRs, using oligonucleotides with additional coding regions for homology arms (20-30 bp). pJW63/64 coding for subunits of the XtpS without attached SYNZIPs were generated by amplifying pJW61/62 with a single phosphorylated [phos.] oligonucleotide pair excluding the SYNZIP coding region followed by T4 DNA ligation (following Thermo Fisher manufacturers' instructions). The control plasmids pCOLA_ara_xtpS/gxpS_tacl_JW coding for the native single protein xtpS/ gxpS were created by Hot Fusion Cloning. Therefore, the plasmid pCOLA_ara/tacl was linearized by PCR using the oligonucleotides AL-XtpS-2-1 and AD64 and the insert *xtpS* was PCR amplified with the oligonucleotides jw0136_FW and jw0137_RV.

The plasmids pJW101/102 coding for NRPSs with two attached SNYZIPs were created by Hot Fusion cloning. Before this final cloning step an pCOLA_ara/tacl plasmid carrying the SYNZIP18 sequence downstream the P_{BAD} promoter was linearized. This linearization step by PCR was done twice and allowed us to incorporate the SYNZIP1 coding region (na28_FW, na29_FW) upstream the stop codon (pQLinkHD-SYNZIP1 was a gift from Amy Keating (2), Addgene plasmid #80647; RRID:Addgene_80647).

The starting point for plasmid pJW103/106 was vector pCDF_ara/tacl. This vector was generated by digesting the plasmids pCOLA_ara/tacl and pCDFDuetTM-1 (Novagen) with the enzymes Xbal and Ndel. The fragment of pCDFDuetTM-1 carrying the pCloDF13 replicon and streptomycin/spectinomycin resistance marker was then T4 ligated with the compatible pCOLA_ara/tacl fragment. Then, this plasmid pCDF_ara/tacl was linearized in two cycles including in parallel the sequence of SYNZIP2 (na32_RV, na33_RV) (pQLinkHD-SYNZIP2 was a gift from Amy Keating (2), Addgene plasmid #80658; RRID:Addgene_80658) downstream the P_{BAD} promoter, followed by the incorporation of the respective NRPS coding regions by Hot Fusion Cloning.

The plasmid pCOLA_ara_ gxpS_tacl_JW was generated in two Hot Fusion Cloning steps. First, the pCOLA_ara/tacl was linearized by PCR using the primers JW_tacl_Pstl_FW2 and jw0064_RV and second the first part of *gxpS* was amplified using the oligonucleotides jw0124_FW/jw0160_RV. This intermediate plasmid was then opened with Pstl and the second *gxpS* part, amplified with jw0151_FW/ jw0161_RV by PCR, was then integrated into the cleaving site by Hot Fusion Cloning. In all PCRs the S7 Fusion High-Fidelity DNA Polymerase (Mobidiag) was used according to the manufacturers' instructions. The amplified DNA was purified with the Invisorb Fragment CleanUp or MSB Spin PCRapace Kits (stratec molecular). The basic cloning of all new generated plasmids (Supplementary Table 3) was performed in *E. coli* DH10B. Each NRPS (subunit) was under the control of a P_{BAD} promotor. Plasmid isolation from *E. coli* was achieved with the Invisorb Spin Plasmid Mini Two Kit (stratec molecular). Restriction enzyme digests and the partial sequencing of essential plasmid regions, especially upstream and downstream of the NRPS genes,

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where the SYNZIP coding sequences were located, confirmed the correct plasmid construction.

1.3 Heterologous expression of NRPS templates and LC-MS analysis

Constructed plasmids were transformed into E. coli DH10B::mtaA. Cells were grown overnight in LB medium containing the necessary antibiotics (50 µg/ml kanamycin, 34 µg/ml chloramphenicol, 50 µg/ml spectinomycin). 100 µl of an overnight culture were used for inoculation of 10 ml LB-cultures supplemented with the respective antibiotics as selection markers and additionally containing 0.002 mg/ml L-arabinose and 2 % (v/v) XAD-16. After incubation for 72 h at 22 °C the XAD-16 was harvested. One culture volume methanol was added and incubated for 60 min at 22 °C. The organic phase was filtrated and a sample was taken of the cleared extract. After centrifugation (17,000 x g, 20 min) the methanol extracts were used for LC-MS analysis. All measurements were performed by using an Ultimate 3000 LC system (Dionex) with an ACQUITY UPLC BEH C18 column (130 Å, 2.1 x 50 mm, 1.7 µm particle size; Waters) at a flow rate of 0.4 ml min⁻¹ using acetonitrile (ACN) and water containing 0.1% formic acid (v/v) in a gradient ranging from 5-95% of ACN over 16 min (40 °C) coupled to an AmaZonX (Bruker) electron spray ionization mass spectrometer. The BPC spectra were recorded in positive ion mode with the range from 100-1200 m/zand ultraviolet (UV) at 200-600 nm. The software Compass DataAnalysis 4.3 (Bruker) was used to evaluate the measurements.

1.4 Peptide quantification

The absolute production titers of selected peptides were calculated with calibration curves based on pure synthetic 1 (for quantification of 1, 10, 11, 22, 23, 27), 2 (for quantification of 2-5, 7-9, 25, 26), 6 (for quantification of 6 and 12), 13 (for quantification of 13 and 14), 15 (for quantification of 15 and 16), 17, 19 (for quantification of 18-21), 24 (for quantification of 24, 30, 31, 32), 28 (for quantification of 28, 29) and 35 (for quantification of 33/34 and 35/36). Therefore, the pure compounds were prepared at different concentrations (100, 50, 25, 12.5, 6.25, 3.125, 1.56, 0.78, 0.39, 0.195 and 0.0195 μ g/mL) and measured by LC-MS using HPLC/MS measurements as described above. The peak area for each compound at different concentrations was calculated using Compass Data Analysis and used for the calculation of a standard curve passing

through the origin. Triplicates of all *in vivo* experiments were measured. The pure peptide standards **1**, **2**, **6**, **13**, **17** and **35** were synthesized in-house (*3*, *4*) and the further pure synthetic **15**, **19**, **24** and **28** were produced by Synpeptide.

1.5 Chemical synthesis

Chemical synthesis of all peptides was performed as described previously (4).

2 Supplementary Tables

 Table S1. ESI-MS data of all produced peptides.

Peptide (#)	theoretical mass-to- charge ratio (<i>m/z</i>)	Molecular formula	Reference
1	[IVI+I1]* 410.20		(5)
1	410.29		(5)
2	586.40	0 ₃₂ H ₅₁ O ₅ N ₅	(6)
3	600.41	$C_{33}H_{53}O_5N_5$	(6)
4	552.41	C ₂₉ H ₅₃ O ₅ N ₅	(6)
5	566.43	C ₃₀ H ₅₅ O ₅ N ₅	(6)
6	556.35	C ₂₇ H ₄₉ N ₅ O ₅ S	-
7	556.41	C28H53N5O6	-
8	570.42	C ₂₉ H ₅₅ N ₅ O ₆	-
9	584.44	$C_{30}H_{57}N_5O_6$	-
10	457.34	$C_{23}H_{44}N_4O_5$	-
11	471.35	$C_{24}H_{46}N_4O_5$	-
12	556.35	$C_{27}H_{49}N_5O_5S$	-
13	589.33	$C_{29}H_{44}N_6O_7$	-
14	555.35	$C_{26}H_{46}N_6O_7$	-
15	634.38	$C_{32}H_{51}N_5O_8$	(4)
16	600 40	$C_{29}H_{53}N_5O_8$	(4)
17	643 43	$C_{23}H_{53}N_{5}O_{5}$	-
18	830 54	$C_{43}H_{74}N_7O_9$	_
10	844 55	$C_{43}H_{7}H_{7}C_{9}$	_
20	858 57		_
20	810 57		_
21	459.30		_
22	425 31		_
23	778 45		_
25	538 40	$C_{20}H_{c4}N_{c}O_{c}$	_
25	552 /1		_
20	425.31		_
28	826.45	C_{221} 1401 V4 C_{4}	-
20	840.47		-
29	702 47		-
30	906 49		-
22	702 47		-
32	259.27		-
24	350.27		-
34	202.25		-
30	392.23		-
27	392.20 214 07		-
<i>১।</i> २८	314.27 329 20		-
30 20	320.29		-
39	342.20		-
40	400.38		-
41	510.39		(7)
42	496.37		(7)

Table S2. Strains used in this work.

Strain	Genotype / NRPS	Reference
<i>E. coli</i> DH10B	F_mcrA (<i>mrr-hsd</i> RMS- <i>mcr</i> BC), 80/acZΔ, M15, Δ/acX74 recA1 endA1 araD 139Δ(ara, leu)7697 galU galK λ rpsL (Strr) nupG / -	(8)
E. coli DH10B::mtaA	DH10B with <i>mtaA</i> from pCK_ <i>mtaA</i> ∆ <i>entD</i> / -	(9)
P. luminescens TTO1	- / gxpS (6)	DSMZ
X. bovienii SS-2004	- / garS/ xfpS (7)	(10)
X. nematophila ATCC 19061	- / xtpS (5)	ATCC
X. budapestensis DSM 16342	- / bicA (11)	DSMZ
X. miraniensis DSM 17902	- / ambS (9)	DSMZ
X. szentirmaii DSM16338	- / szeS	DSMZ
X. indica DSM 17382	- / xldS (9)	DSMZ
B. licheniformis ATCC 10716	- / bacA (12)	M. A. Marahiel / ATCC
B. subitlis MR 168	- / srfA (13)	ATCC

Table S3. Plasmids used in this work.

Plasmids	Genotype	Reference
	ori 2µ, kanMX4, ori CoIA, kan ^R , P _{BAD}	
pFF1_22A_szeS_gxpS	szeS_FtA ₁ T ₁ C/E ₂ A ₂ T ₂ C ₃ -gxpS_A ₃ T ₃ C/E ₄ A ₄ T ₄ C/E ₅ A ₅ T ₅ TE,	(4)
	Ypet-Flag	
	ori 2µ, kanMX4, <i>araC-P_{BAD}</i> , ori ColA, Ypet-Flag, kan ^R ,	
pFF1_NRPS_6	bacA-A1T1CyA2T2C3A3T3CD _{sub4} _sfrA-BC-	(3)
	C _{Asub6} A6T6E6C7A7T7TE	
pCOLA_ara/tacl	ori ColA, kan ^k , <i>araC-P_{BAD}</i> and <i>tacl</i>	(14)
pCK_0402	ori p15A, cm ^{κ} , araC-P _{BAD} and tacl-araE	unpublished
	ori CioDF13, spec ^w , <i>araC-P_{BAD}</i> and <i>tacl</i>	this study
pCOLA_ara_xipS_tacl_JW	on ColA, kan ^R , araC- P_{BAD} xips and tack	this study
	ori p154 cm ^R araC- P_{BAD} yth SAJT-C/E-A-T-C-	
pJW61	SYNZIP17 and tacl-araF	this study
	ori ColA, kan ^R , <i>araC-P_{BAD}</i> SYNZIP18-	
pJW62	$xtpS_A_3T_3C/E_4A_4T_4TE$ and $tacl$	this study
~ NM62	ori p15A, cm ^R , araC-P _{BAD} xtpS_A ₁ T ₁ C/E ₂ A ₂ T ₂ C ₃ and tacl-	this study
pJvv63	araE	this study
pJW64	ori ColA, kan ^R , <i>araC-P_{BAD} xtpS</i> _A ₃ T ₃ C/E ₄ A ₄ T ₄ TE, <i>tac</i> l	this study
p.IW75	ori p15A, cm ^R , <i>araC-P_{BAD} gxpS</i> _A ₁ T ₁ C/E ₂ A ₂ T ₂ C ₃ -	this study
ponto	SYNZIP17 and tacl-araE	the ordery
pJW76	ori ColA, kan ^ĸ , <i>araC-P_{BAD}</i> SYNZIP18-	this study
·	$gxpS_A_3I_3C/E_4A_4I_4C/E_5A_5I_5IE$ and $tacle$	2
pJW77	ori pisa, cm ^{-,} , arac- P_{BAD} Dica_A ₁ I ₁ C/ $E_2A_2I_2C_3$ -	this study
	ori p154 cm^{R} arac P_{cut} ambs $A_{\text{cut}}C/E_{\text{cut}}A_{\text{cut}}C_{\text{cut}}$	
pJW91	SYNZIP17 and tacl-ara F	this study
	ori p15A cm ^R araC- P_{RAD} szeS EtA $_1$ C/E $_2$ A $_2$ T $_2$ C $_2$ -	
pJW92	SYNZIP17 and tacl-araE	this study
114/00	ori p15A, cm ^R , araC-P _{BAD} x/dS C ₁ A ₁ T ₁ C/E ₂ A ₂ T ₂ C ₃ -	
pJW93	SYNZIP17 and tacl-araE	this study
n IW(100	ori p15A, cm ^R , <i>araC-P_{BAD} xtp</i> S_A ₁ T ₁ C/E ₂ -(GS) ₂ -SYNZIP17	this study
p3W100	and tacl-araE	
pJW102	ori ColA, kan ^R , <i>araC-P_{BAD}</i> SYNZIP18- <i>xtp</i> S_A ₂ T ₂ C ₃ -(GS) ₂ -	this study
po	SYNZIP1 and tacl	
pJW103	ori CloDF13, spec ^k , <i>araC-P_{BAD} xtp</i> S_SYNZIP2-	this study
	$A_3I_3C/E_4A_4I_4I \in \text{and } tacl$	this study
pJW114	OILPTSA, CIT, AIAC-P _{BAD} DacA_ATTICyA212C3- SVNZIP17 and tecl-araF	this study
	ori Cold kan ^R araC. Pros SVN7IP18-bach A3T3Ca . A	this study
pJW116	sfrA-BC Charle 6A6T6E6C7A7T7TE and tack	
	ori p15A. cm ^R . araC- P_{BaD} bacA A1T1CvA2T2C3A3-	this study
pJW118	SYNZIP17 and <i>tacl-araE</i>	· · · · · · · · · · · · · · · · · · ·
~ W(120	ori ColA, kan ^R , <i>araC-P_{BAD}</i> SYNZIP18- <i>bacA</i> _T3C _{Dsub} 4-	this study
pJvv120	sfrA-BC_C _{Asub} 6A6T6E6C7A7T7TE and tacl	
n.IW/122	ori p15A, cm ^R , <i>araC-P_{BAD} bacA</i> _A1T1CyA2T2C3A3T3-	this study
pow 122	SYNZIP17 and tacl-araE	
pJW124	ori ColA, kan ^R , <i>araC-P_{BAD}</i> SYNZIP18- <i>bacA</i> _C _{Dsub} 4- <i>sfrA</i> -	this study
1 -	BC_C _{Asub} 6A6T6E6C7A7T7TE and <i>tacl</i>	
pJW126	ori p15A, cm ⁺ , araC- P_{BAD} bacA_A111CyA212C3A313	this study
	$G_{\text{Dsub}4}$ -STNZIPT7 and lact-arac	this study
pJW128	BC C A = 646T6E6C747T7TE and tacl	
	ori p15A cm ^R araC- P_{RAD} x/dS C ₁ -SYNZIP17 and tacl-	
pJW141	araE	this study
	ori p15A, cm ^R , <i>araC-P_{BAD} xtp</i> S_A ₁ T ₁ C/E ₂ A ₂ T ₂ C ₃ -	this study
pNA1	SYNZIP19 and tacl-araE	-
pNA2	ori p15A, cm ^R , araC-P _{BAD} xtpS_A ₁ T ₁ C/E ₂ A ₂ T ₂ -SYNZIP17	this study
	und tacl-araE	
pNA3	ori ColA, kan ^R , <i>araC-P_{BAD}</i> SYNZIP18- <i>xtpS</i> _	this study
	$C_3A_3T_3C/E_4A_4T_4TE$ und <i>tac</i> l	
pNA4	ori p15A, cm ^r , araC-P _{BAD} xtpS_A ₁ T ₁ C/E ₂ A ₂ -SYNZIP17	this study

pNA5	ori ColA, kan ^R , <i>araC-P_{BAD}</i> SYNZIP18- <i>xtpS</i> _	this study
	$T_2C_3A_3T_3C/E_4A_4T_4TE$ und <i>tacl</i>	
DNIAQ	ori p15A, cm ^R , <i>araC-P_{BAD} xtp</i> S_A ₁ T ₁ C/E ₂ A ₂ T ₂ C ₃ -(GS) ₅ -	this study
μιλο	SYNZIP17 and tacl-araE	
nNA9	ori p15A, cm ^R ,	this study
privio	SYNZIP17 and tacl-araE	
pNA10	ori p15A, cm ^R , <i>araC-P_{BAD} xtpS</i> _A ₁ T ₁ C/E ₂ A ₂ T ₂ C ₃ -(GS) ₂ -	this study
	SYNZIP17 and tacl-araE	
pNA15	ori ColA, kan ^R , <i>araC-P_{BAD}</i> SYNZIP18- <i>xtp</i> S_T ₂ C ₃ A ₃ -	this study
	SYNZIP1 and tacl	
pNA16	ori CloDF13, spec [*] , <i>araC-P_{BAD}</i> SYNZIP2-	this study
- 1447	$XtpS_1_3C/E_4A_4I_4IE$ and tacl	بالمنام مقاطة
pina 17	on ColA, kan ^{-,} , arac- P_{BAD} SYNZIP 18- xtp S_C ₃ A ₃ I ₄ -	this study
	SYNZIP1 and tacl	
pNA18	ori CloDF13, spec ^ĸ , <i>araC-P_{BAD}</i> SYNZIP2-	this study
	<i>xtp</i> S_C/E ₄ A ₄ T ₄ TE and <i>tac</i> l	
pNA26	ori p15A, cm ^R , <i>araC-P_{BAD} gxpS</i> _A ₁ T ₁ C/E ₂ A ₂ -SYNZIP17	this study
	and <i>tac</i> l- <i>araE</i>	
pNA27	ori ColA, kan ^R , <i>araC-P_{BAD}</i> SYNZIP18- <i>gxpS</i> _T ₂ C ₃ A ₃ -	this study
	SYNZIP1 and tacl	
pNA28	ori CloDF13, spec ^R , <i>araC-P_{BAD}</i> SYNZIP2-	this study
	$gxpS_T_3C/E_4A_4T_4C/E_5A_5T_5TE$ and $tacl$	
pNA29	ori p15A, cm ^k , <i>araC-P_{BAD} sze</i> S_ C ₁ A ₁ T ₁ C/E ₂ A ₂ -SYNZIP17	this study
pNA30	ori ColA, kan'', arac- P_{BAD} SYNZIP18-szeS_1 ₂ C ₃ A ₃ -	this study
- 1404	SYNZIP1 and tacl	this study.
pina31	OF CIODE 13, SPEC [*] , $araC - P_{BAD} SYNZIPZ$ -	this study
DNIA25	$S265_{13}C_4A_4I_4C_5A_5I_5C_6A_6I_6IE$ and BCI	this study
phass	OIT COIA, Kall, alac-FBAD STINZIF TO-gals_1203A3- SYNZIP1 and tack	this study
DNA50	ori n15A cm ^R are $C_{R_{12}}$ yf S_{11} C.A. SVNZIP17 and fact	this study
PINADO	araF	this study
nNA60	ori ColA kan ^R araC-Powe SYNZIP18-	this study
F10.000	xfpS T ₁ E ₁ C ₂ A ₂ T ₂ C ₂ A ₃ T ₃ TE and <i>tac</i>	the otday

Table S4. Oligonucleotides used in this work. Correlations of plasmids to figures from the main text and supplementary informationt are represented in brackets.

Plasmids	Oligo- nucleotide	Sequence $(5' \rightarrow 3'; overlapping ends)$	Template
	KB-pACYC-FW	GAACAGTTAAAACAGAAGCGTGAACAATTAAAGCAAAAGATCGCCAATCTGCGTAA GGAGATCGAAGCCTACAAGTGACAATTAATCATCGGCTCG	pCK_0402
	KB-pACYC-RV	TICACGCTTCTGTTTTAACTGTTCGATGCGATTACGCAATTCAGCCTTTTTCGATTTT AATTCCTCCTTCTCGTT <u>CATGGAATTCCTCCTGTTAGC</u>	pCK_0402
pJW61	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	
(NRPS-1, NRPS-2, NRPS-8, NRPS-9)	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	
	KB-P1-FW	TGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG	X. nematophila ATCC 19061
	KB-P1-RV	CGATTTTAATTCCTCCTTCTCGTTCCAGGTTTTTAACAACAATGTGC	X. nematophila ATCC 19061
	KB-pCOLA-FW	CATTGACAAAGAGCTGCGTGCCAACGAAAACGAACTTCGCGCCCTTGATAACGAGC TGACTGCAGCTATCTCATGACAATTAATCATCGGCTCG	pCOLA_ara/tacl
	KB-pCOLA-RV		pCOLA_ara/tacl
pJW62 (NRPS-1, NRPS-3,	KB-pCOLA-II-FW	TGACAATTAATCATCGGCTCG	
NRPS-7, NRPS-12, NRPS-17, NRPS-18,	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	
NRPS-19)	KB-P2-FW	AACGAGCTGACTGCAGCTATCTCA	X. nematophila ATCC 19061
	KB-P2-RV	ATACGAGCCGATGATTAATTGTCACAGCGCCTCCACTTCG	X. nematophila ATCC 19061
n IW/63	jw0061_FW	[phos.] TGACAATTAATCATCGGCTCG	pJW61
(NRPS-3, NRPS-4)	jw0062 RV	CCAGGTTTTTAACAACAATGTGC	pJW61
	iw0063 FW	[phos.] TTATGTATTCATCAACTTTTTGAACAGC	pJW62
(NRPS-2, NRPS-4)	jw0064 RV	CATGGAATTCCTCCTGTTAGCC	pJW62
	KB-pACYC-II-FW	AACGAGAAGGAAGGAATTAAAATCG	pJW61
pJW75	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-5, NRPS-7,	iw0124 FW	GGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGAAATTATC	P. luminescens TTO1
NRPS-10)	iw0125_RV		P. luminescens TTO1
	KB-pCOLA-II-FW		n IW62
pJW76	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	p.IW62
(NRPS-5, NRPS-8, NRPS-11, NRPS-13,	iw0172 FW		P. luminescens TTO1
NRPS-14, NRPS-15, NRPS-16)	iw0127 RV		P. luminescens TTO1
			n IMG1
p.IW/114			pJW61
(NRPS-6, NRPS-11,	iw208 EW		
NRPS-12)	jw208_FW		pFF1_NRPS_6 (3)
	Jw209_RV		
n IW/116	KB-pCOLA-II-FW		pJW62
(NRPS-6, NRPS-9,	KB-pCOLA-II-RV		pJW62
NRPS-10, NRPS-43)	JW0211_FW		pFF1_NRPS_6 (3)
. <u> </u>	jw0212_RV	<u>CGAGCCGATGATTAATTGTCA</u> TGAAACCGTTACGGTTTGTGTATTA	pFF1_NRPS_6 (3)
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pJW77	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(INCE 3-13)	jw0128_FW	<u>GGGCTAACAGGAGGAATTCCATG</u> AAAGATAACATTGCTACAGTGGCAAATAG	X. budapestensis DSM 16342
	jw0129_RV	<u>CGATTTTAATTCCTCCTTCTCGTT</u> CCAAGTTTTCAGCAACAACTGG	X. budapestensis DSM 16342
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pJW91	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-13, NRPS-17)	jw0162_FW	<u>GCTAACAGGAGGAATTCCATG</u> AAAAATGATAAGGTGATGACTCTG	X. miraniensis DSM 17902
	jw0163_RV	TCGATTTTAATTCCTCCTTCTCGTTCCACGTTTCCAGCAATAACC	X. miraniensis DSM 17902
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pJW92	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-14, NRPS-19)	jw0164_FW	GCTAACAGGAGGAATTCCATGAAAGGTAGTATTGCTAAAAAGGGAG	X. szentirmaii DSM16338
	jw0165_RV	TCGATTTTAATTCCTCCTTCTCGTTCCAGCTTTCCAGCAATAACC	X. szentirmaii DSM16338
pJW93	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
(NRPS-16, NRPS-18)	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61

	jw0166_FW	GCTAACAGGAGGAATTCCATGAAACTTTGGAACTATAAAATGAATATGAC	X. indica DSM 17382
	jw0167_RV	TCGATTTTAATTCCTCCTTCTCGTTGAAATCCACCAACAGTTGTTGAC	X. indica DSM 17382
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pJW100	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-26)	KB-P1-FW	TGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG	X. nematophila ATCC 19061
	jw0179_RV	CGATTTTAATTCCTCCTTCTCGTT G	X. nematophila ATCC 19061
	na29_FW	AACCTGGTTGCGCAGCTCGAAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC	pJW101
n IW/102	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	pJW101
(NRPS-26)	jw0180_FW	AACGAGCTGACTGCAGCTATCTCACTGTGTATCCATCAGTTAATTGAACAACAG	X. nematophila ATCC 19061
	jw0182 RV	CGTTTTCGAGCTGCGCAACCAGGTT GGATCCAGACCCCGGGTTTTTAACAACAAT	X. nematophila ATCC 19061
	na34 FW	TGACAATTAATCATCGGCTCG	pCDF ara/tacl
	na32 RV	GTTCTGTTCATCACGTTCCAGCTGCAGGTTGTCTTTTTTCAGACGTGCGATTTTCTT	pCDF ara/tacl
	na33 RV	ACGCAGATACGCGTTACGCGC <u>CATGGAATTCCTCCTGTTAGCC</u> CTGTTCGTGAGACGCAACTTCGTTTTCGAGACGCGCGATTTCGTCACGCAGGTTCG	nCDE ara/tacl
	na04_RV	CGATGATTTTTTCCAG <u>GTTCTGTTCATCACGTTCCAGC</u>	
pJW103 (NRPS-26)	11404_NV		- V. nomotophilo ATCC 10061
(1111 0 20)	jw0165_FW		
	jw0188_RV		X. nematophila ATCC 19061
	jw0189_FW	CGGCGTATTGGTTTAGGCCTGT	X. nematophila ATCC 19061
	na07_RV	<u>CGAGCCGATGATTAATTGTCA</u> CAGCGCCTCCACTTCG	X. nematophila ATCC 19061
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pJW118	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-44)	jw208_FW	<u>GCTAACAGGAGGAATTCCATG</u> GTTGCTAAACATTCATTAGAAAATGGG	pFF1_NRPS_6 (3)
	jw0214_RV	CGATTITAATTCCTCCTTCTCGTTGTAGCGGCGATCCATTGT	pFF1_NRPS_6 (3)
	KB-pCOLA-II-FW	TGACAATTAATCATCGGCTCG	pJW62
pJW120	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	pJW62
(NRPS-44)	jw0216_FW	CGAGCTGACTGCAGCTATCTCAGAAGCGCCGCGGG	pFF1_NRPS_6 (3)
	jw0212_RV	CGAGCCGATGATTAATTGTCA TGAAACCGTTACGGTTTGTGTATTA	pFF1_NRPS_6 (3)
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pJW122	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-45)	jw208_FW	GCTAACAGGAGGAATTCCATGGTTGCTAAACATTCATTAGAAAATGGG	pFF1_NRPS_6 (3)
	jw0218_RV	CGATTTTAATTCCTCCTTCTCGTT	pFF1_NRPS_6 (3)
	KB-pCOLA-II-FW	TGACAATTAATCATCGGCTCG	pJW62
pJW124	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	pJW62
(NRPS-45)	jw0220_FW	CGAGCTGACTGCAGCTATCTCA TTGTCTTCAGCGCAAAAAAGG	pFF1_NRPS_6 (3)
	jw0212_RV	CGAGCCGATGATTAATTGTCA TGAAACCGTTACGGTTTGTGTATTA	pFF1_NRPS_6 (3)
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
p.IW126	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-46)	jw208_FW	GCTAACAGGAGGAATTCCATGGTTGCTAAACATTCATTAGAAAATGGG	pFF1_NRPS_6 (3)
	jw0222_RV	CGATTITAATTCCTCCTTCTCGTTGGCATGGCTATTTTCCCATT	pFF1_NRPS_6 (3)
	KB-pCOLA-II-FW	TGACAATTAATCATCGGCTCG	pJW62
n IW/128	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	pJW62
(NRPS-46)	iw0224 FW	CGAGCTGACTGCAGCTATCTCACAAAAAGAACGGATGAAGGAGC	pFF1 NRPS 6 (3)
	iw0212 RV		pEF1_NRPS_6 (3)
	KB-pACYC-II-FW	AACGAGGAGGAGGAATTAAAATCG	pJW61
	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	p.JW61
pJVV141 (NRPS-43)	iw0166 FW	GCTAACAGGAGGAATTCCATGAAACTTTGGAACTATAAAATGAATATGAC	X indica DSM 17382
- /	iw0254_RV/		X indica DSM 17382
		CGTGAACAGCTGAAACAGAAACTGGCGGCGCTCTGCGTAACAAACTGGACGCGTACA	DCK 0400
		AAAACCGTCTG <u>TGACAATTAATCATCGGCTCG</u> AACGAACTGGAATCTCTGGAGAACAAAAAAGAAGAACTGAAGAACCGTAACGAAGA	pUK_0402
pNA1 (NRPS-20)			pUK_0402
(1111 0 20)	JW0064_RV	CATGGAATTUUTUTGTTAGUU	pCK_0402

	na04_RV	CTCCAGAGATTCCAGTTCGTT <u>CCAGGTTTTTAACAACAATGTGC</u>	X. nematophila ATCC 19061
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAAATCG	pJW61
pNA2	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-24, NRPS-27)	na03_FW	TGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG	X. nematophila ATCC 19061
	na05_RV	CGATTTTAATTCCTCCTTCTCGTT <u>AACACGATCACGGGATATTG</u>	X. nematophila ATCC 19061
	KB-pCOLA-II-FW	TGACAATTAATCATCGGCTCG	pJW62
nNA3	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	pJW62
(NRPS-24)	na06	AACGAGCTGACTGCAGCTATCTCATTGCCTTTATCGTTTGGTCAAC	X. nematophila ATCC 19061
	na07	CGAGCCGATGATTAATTGTCACAGCGCCTCCACTTCG	X. nematophila ATCC 19061
	KB-pACYC-II-FW		p.IW61
pNA4	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	p.IW61
(NRPS-25, NRPS-28, NRPS-29, NRPS-30, NRPS-31, NRPS-32	na03 FW	TGGGCTAACAGGAGGGAATTCCATGAAAGATAGCATGGCTAAAAAAGGG	X nematophila ATCC 19061
NRPS-33, NRPS-42)	na00_111		
nNA5	KB-PCOLA-II-FW		pJW62
(NRPS-25,	KB-pCOLA-II-RV		pJW62
NRPS-48)	na14_FW	AACGAGCTGACTGCAGCTATCTCA <u>GTTGCGCCACAAGGAGAA</u>	X. nematophila ATCC 19061
	na07_RV	CGAGCCGATGATTAATTGTCACAGCGCCTCCACTTCG	X. nematophila ATCC 19061
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pNA8	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-23)	na3_FW	TGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG	X. nematophila ATCC 19061
	na17_RV	CGATTITAATTCCTCCTTCTCGTT GGTTTTTAACAACAATGTGC	X. nematophila ATCC 19061
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pNA9	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
(NRPS-22)	na3_FW	TGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAAGGG	X. nematophila ATCC 19061
	na19_RV	CGATTTTAATTCCTCCTTCTCGTTCGAACCTGAGCCGGATCCAGACCCCCAGGTTTT TAACAACAATGTGC	X. nematophila ATCC 19061
	KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pNA10	KB-pACYC-II-FW KB-pACYC-II-RV	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC	pJW61 pJW61
pNA10 (NRPS-21)	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>TGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG	pJW61 pJW61 X. nematophila ATCC 19061
pNA10 (NRPS-21)	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>TGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT G	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061
pNA10 (NRPS-21)	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na29_FW	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>TGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT G <u>AACCTGGTTGCCGCAGCCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAAC</u> CCTGAAGAAAAGGAACCTGCACACAAAAAGCCTGATCGCGTAC	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61
pNA10 (NRPS-21)	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na29_FW na30_RV	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>IGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT G AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC TGAGATAGCTGCAGTCAGCTCG	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 pJW61
pNA10 (NRPS-21) 	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na29_FW na30_RV na22_FW	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>TGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT G <u>AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC</u> <u>CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC</u> <u>TGAGATAGCTGCAGTCAGCTCG</u> <u>GGCTAACAGGAGGAATTCC</u> ATGGTTGCGCCACAAGGAGAA	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 X. nematophila ATCC 19061
pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40)	KB-pACYC-II-RW KB-pACYC-II-RV na3_FW na20_RV na29_FW na30_RV na22_FW na41_RV	AACGAGAAGGAAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>TGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT <u>G</u> <u>AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC TGAGATAGCTGCAGTCAGCTCG <u>GGCTAACAGGAGGAATTCC</u>ATGGTTGCGCCACAAGGAGAA <u>CGAGCCGATGATTAATTGTCA</u>ATAGACCTGCCGGGCAAAC</u>	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061
pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40)	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na29_FW na30_RV na22_FW na41_RV na33_RV	AACGAGAAGGAAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>IGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT G AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC TGAGATAGCTGCAGTCAGCTCG GGCTAACAGGAGGAATTCCATGGTTGCGCCACAAGGAGAA <u>CGAGCCGATGATTAATTGTCA</u> ATAGACCTGCCGGGCAAAC <u>CTGTTCGTGAGACGCCACTTCGTTTCGAGACGCCGCGATTCCGTCACGCAGGTTCG</u>	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pCDF_ara/tacl
pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40) pNA16	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na29_FW na30_RV na22_FW na41_RV na33_RV na34_FW	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>TGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT G <u>AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAAACGAAAC</u> <u>CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC</u> <u>TGAGATAAGCTGCAGTCAGCTCG</u> <u>GGCTAACAGGAGGAATTCCATGGTTGCGCCACAAGGAGAA</u> <u>CGAGCCGATGATTAATTGTCA</u> ATAGACCTGCCGGGCAAAC <u>CTGTTCGTGAGACGCAACTTCGTTTCGAGACCGCGGCAAAC</u> <u>CTGTTCGTGAGACGCAACTTCGTTTCGAGACCGCGCGCATTCGTCACGCAGGTTCG</u> <u>CGATGATTTATTCTCAGGTTCT_GTTCATCACGTTCCAGC</u> <u>TGACAATTAATCGGCTCG</u>	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pCDF_ara/tacl pCDF_ara/tacl
pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40) pNA16 (NRPS-28, NRPS-30, NRPS-31, NRPS-35,	KB-pACYC-II-RV KB-pACYC-II-RV na3_FW na20_RV na29_FW na30_RV na30_RV na22_FW na41_RV na33_RV na34_FW na42_FW	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>IGGGCTAACAGGAGGAATTCCATG</u> AAAGATAGCATGGCTAAAAAGGG <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT <u>G</u> <u>AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC</u> <u>CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC</u> <u>TGAGATAGCTGCAGTCAGCTCG</u> <u>GGCTAACAGGAAGGAATTCCATGGTTGCGCCACAAGGAGAA</u> <u>CGAGCCGATGATTAATTGTCA</u> ATAGACCTGCCGGGCAAAC <u>CTGTTCGTGAGACGCAACTTCGTTTCGAGACCGCGGCAAAC</u> <u>CTGTTCGTGAGACGCAACTTCGTTTCGAGACCGCGCGATTCGTCACGCAGGTTCG</u> <u>CGATGATTTATTGTCA</u> ATAGACCTGCCGGGCAAAC <u>CTGTTCGTGAGACGCAACTTCGTTTCGAGACCGCGCGATTTCGTCACGCAGGTTCG</u> <u>CGATGATTTTTCCAGGTTCT</u> GTTCATCACGTTCCAGC <u>TGACAATTAATCATCGGCTCG</u> TTGGGCTAACAGGAGGAATTCC ATGGCGGCTCCGCAGGG	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pCDF_ara/tacl pCDF_ara/tacl X. nematophila ATCC 19061
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pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40) pNA16 (NRPS-28, NRPS-30, NRPS-31, NRPS-35, NRPS-38) pNA17 (NRPS-27)	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na20_RV na20_RV na22_FW na41_RV na34_FW na34_FW na42_FW na28_FW na29_FW na30_RV na30_RV na30_RV na31_RV na32_RV na32_RV na32_RV	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC <u>TGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG</u> <u>CGATTTTAATTCCTCCTTCTCGTT</u> GGATCCAGACCCCCAGGTTTTTAACAACAATGT G AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC TGAGATAGCTGCAGTCAGCTCG GGCTAACAGGAGGAATTCCATGGTTGCGCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATAGACCTGCCGGGCAAAC CCTGTCGTGAGAACGCAGCTCGTTTCGAGACGCGGGCAAAC CTGTTCGTGAGAACGCAACTTCGTTTCGAGACGCGGGCAAAC CTGTTCGTGAGAACGCAACTCGTTTCGAGACGCGGGCAAAC CTGTTCGTGAGAACGCAGGTTCG GTTCATCACGTTCCAGC TGACAATTAATCATCGGCTCG TGACAATTAATCATCGGCTCG TGGGCTAACAGGAGGAATTCC ATGGCGGCTCCGCAGGG CGAGCCGATGATTAATTGTCA CAGCGCCTCCACTTCG CACAAAAAGACCTGATCGCGTACCTGGAGAAAGAAATCGCGAATCTGCGTAAGAA AATCGAAGATGACAATTAATCATCGGCTCG AACCTGGTTGCGCAGCTGCAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC CCTGAAGAAAAGAA	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 DCDF_ara/tacl pCDF_ara/tacl pCDF_ara/tacl
pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40) pNA16 (NRPS-28, NRPS-30, NRPS-31, NRPS-35, NRPS-38) pNA17 (NRPS-27)	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na29_FW na30_RV na22_FW na41_RV na34_FW na42_FW na42_FW na28_FW na28_FW na30_RV na30_RV na30_RV na32_RV na32_RV na33_RV na34_FW na34_FW	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC IGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG CGATTTTAATTCCTCCTTCTCGTTGGATCCAGACCCCCAGGTTTTTAACAACAATGT G AACCTGGTTGCCCAGCTCCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC IGAGATAGCTGCAGTCAGCTCG GGCTAACAGGAGGAATTCCATGGTTGCGCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATGGTTGCGCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATAGACCTGCCGGGCAAAC CTGTTCGTGAGACGCAACTTCGTTTCGAGACCGCGCGCATTTCGTCACGCAGGTTCG CGATGATTTATTCATCGGTTCG GGCTAACAGGAGGAATTCC ATGGCGGCTCCGCAGGG CGAGCCGATGATTAATTGTCA CAGCGCCTCCACTTCG CACAAAAAAGACCTGACCGCGCTGCAGGG CGAGCCGATGATTAATTGTCA CAGCGCCTCCACTTCG CACAAAAAAGACCTGCACGCTGCAAAACGAAATCGCGAATCTGCGTAAGAA AATCGAAGAAAGACCTGCACAAAAAAGACCTGATCGCGTAC TGAGATGACGTGCAGCTCGCAAAACGAAATCGCGAATCTGCGTAAGAA AATCGAAGAAAAGAA	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 X. nematophila ATCC 19061 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 pJW61 pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 X. nematophila ATCC 19061 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pCDF_ara/tacl pCDF_ara/tacl
pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40) pNA16 (NRPS-28, NRPS-30, NRPS-31, NRPS-35, NRPS-38) pNA17 (NRPS-27) pNA18 (NRPS-27)	KB-pACYC-II-RV na3_FW na20_RV na20_RV na22_FW na30_RV na22_FW na33_RV na34_FW na42_FW na42_FW na28_FW na29_FW na29_FW na30_RV na37_RV na33_RV na34_FW na33_RV na34_FW na34_FW na38_FW na38_FW	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC IGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG CGATTTTAATTCCTCCTTCTGGTTGGATCCAGACCCCCAGGTTTTTAACAACAATGT G AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC TGAGATAGCTGCAGTCAGCTCG GGCTAACAGGAGGAATTCCATGGTTGCGCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATGGTTGCGCCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATAGACCTGCCGGGCAAAC CTGTTCGTGAGACGCAACTTCGTTTTCGAGACCGCGCGAAAC CTGTTCGTGAGACGCAACTTCGTTTTCGACACGCGCGCGATTTCGTCACGCAGGTTCG CGATGATTTTTTTCCAGGTTCT GTTCATCACGTTCCAGC CGATGATTTTTTTCCAGGTCG TGACAATTAATCATCGGCTCG TGGCGCAACGGAGGAATTCC ATGGCGGCCTCCGCAGGG CGAGCCGATGATTAATTGTCA CAGCGCCTCCACTTCG CACAAAAAAGACCTGATCGCGTACCTGGAGAAAATGAGAAATGAGAACGAAAA AATCGAAGAATGACCATTTAATCATCGGCTCG AACCTGGTTGCGCAGCTGCAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC CCTGGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAAC CCTGAAGAAAAGAA	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 pJW61 X. nematophila ATCC 19061
pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40) pNA16 (NRPS-28, NRPS-30, NRPS-31, NRPS-35, NRPS-38) pNA17 (NRPS-27) pNA18 (NRPS-27) pNA26 (NRPS-34, NRPS-35.	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na20_RV na20_RV na22_FW na30_RV na34_FW na34_FW na42_FW na22_FW na34_FW na28_FW na29_FW na30_RV na30_RV na30_RV na32_RV na34_FW	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC TGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG CGATTTTAATTCCTCCTTCTCGTTGGATCCAGACCCCCAGGTTTTTAACAACAATGT G AACCTGGTTGCGCAGCTCGAAAACGAAGTTGCCTCTCTGGAAAATGAGAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC TGAGATAGCTGCAGTCAGCTCG GGCTAACAGGAGGAATTCCATGGTTGCGCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATGGTTGCGCCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATAGACCTGCCGGGCAAAC CTGTTCGTGAGACGCAACTTCCTTGGAGAAGCGGCGCGCGATTTCGTCACGCAGGGTTCG CGATGATTTTTTCCAGGTTCC ATGGCGGCTCCGCAGGG CGAGCCGATGATTAATGTCC ATGGCGGCTCCGCAGGG CGAGCCGATGATTAATGTCC ATGGCGGCTCCCGCAGGG CGAGCCGATGATTAATCGTCCG CACAAAAAAGACCTGCTCGCGAGAAATCGCGAATCTGCGTAAGAA AATCGAAGAATGACAATTAATCATCGGCTCG AACCTGGTTGCGCAGCTCCGCAAAAAGAACCTGATCGCGAAATGAGAAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGCTCGGCGATCTGCGTAAGAA AATCGAAGAATGACAATTAATCATCGGCTCG GTTCGTTCCGCAGCTGCACAAAAAAGACCTGATCGCGAATCGGCGAACG CCTGAAGAAAAAGAACCTGCACAAAAAAAGACCTGATCGCGTACGTA	pJW61 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061 pJW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061
pNA10 (NRPS-21) pNA15 (NRPS-28, NRPS-29, NRPS-32, NRPS-37, NRPS-38, NRPS-40) pNA16 (NRPS-28, NRPS-30, NRPS-38, NRPS-35, NRPS-38) pNA17 (NRPS-27) pNA18 (NRPS-27) pNA26 (NRPS-34, NRPS-35, NRPS-38, NRPS-35, NRPS-38, NRPS-35, NRPS-38, NRPS-35, NRPS-38, NRPS-35, NRPS-38, NRPS-39	KB-pACYC-II-FW KB-pACYC-II-RV na3_FW na20_RV na29_FW na30_RV na22_FW na41_RV na34_FW na34_FW na42_FW na7_RV na28_FW na29_FW na30_RV na30_RV na30_RV na32_RV na32_RV na32_RV na33_RV na34_FW na44_FW n44_FW n	AACGAGAAGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGC TGGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGG CGATTTTAATTCCTCCTTCTCGTTGGATCCAGACCCCCAGGTTTTTAACAACAATGT G AACCTGGTTGCGCAGGCTCGAAAACGAAGTTGCGTCTCTGGAAAATGAGAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGACCTGATCGCGTAC TGAGATAGCTGCAGTCAGCTCG GGCTAACAGGAGGAATTCCATGGTTGCGCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATGGTTGCGCCACAAGGAGAA CGAGCCGATGATTAATTGTCAATAGACCTGCCGGGCAAAC CTGTTCGTGAGAACGCAACTTCGTTTCGAACAGCGGCGCGAATTCGTCACGCAGGTTCG CGATGATTTTTTCCAGGTTCC ATGGCGGCCTCCGCAGGG CGAGCCGATGATTAATGTCC ATGGCCGCCTCCGCAGGG CGACGCAGATGACAATTAATCATCGGCTCG AACCTGGTTGCGCAGCTGCAATTAATCATCGGCCTGC AACCTGGTTGCGCAGCTGCAATTAATCATCGGCTCG AACCTGGTTGCGCAGCTGCAAAAAGAACCTGATCGCGAATCTGCGTAAGAA AATCGAAGAATAAACAATTAATCATCGGCCTG AACCTGGTTGCGCAGCTGCAAAAAGAACCTGCTGCGAAAATGAGAAACGAAAC CCTGAAGAAAAAGAACCTGCACAAAAAAGAACCTGCTGCGTAACGAA CCTGGTTGCGCAGCTGCAAAAAAGAACCTGCTGCGCGTTAGTACCG GTTCTGTTCATCACGTTCCAGCTGCACAAAAAGAACCTGATCGCGTAACGAC CCTGAAGAAAAAGAACCTGCACAAAAAAGAACCTGATCGCGCGTTAGTACCG GTTCTGTTCAACGTTCCAGCTGCAAAAAAGAACCTGCTGCGCGTTAGTACCG GTTCTGTTCAACGTTCCAGCTGCAAAAAAGAACCTGGTTCCTGTTAGCCC CTGTCGGAGCTGCAGCCACCAGGTTCCATCGCGCGTTAGTACCG CTGTCGTGACGGCCAACCAGGTTGCCTGTCAGCCGCGCATTGCCGCG AACCAGAAAAGGACCGGCTACCAGGTTGCCCCTGTTAGCCC CTGTCGTGGACGGCCAACCAGGTTGCCGCTGATTGGCCGCCTCACCTGC GAGCGATTAACCGGTTACGCGCCATGGAATTCCTCCTGTTAGCCC CTGTCGTGGAACGCAACTCGCCAAAAAAGCCGCGCCCCCACTTCG AAACGAAGGAGGGAGGAATTAAAATCG CATGGAATTCCTCCTGTTAGCC	р.JW61 р.JW61 x. nematophila ATCC 19061 X. nematophila ATCC 19061 p.JW61 p.JW61 X. nematophila ATCC 19061 X. nematophila ATCC 19061

PNA27 (NREPS.31, NRPS.35, NRPS.31, NRPS.35, NRPS.32, NRPS.35,		na52	CGATTTTAATTCCTCCTTCTCGTTATAAATTTGGCGAGCAAAAGC	P. luminescens TTO1
NPRPS 31, NPRPS 33, NPRPS 33, NPRPS 33, NPRPS 33, NPRPS 34, NPRPS 33, NPRPS 34, NPRPS 30, NPRPS 34, NPRPS 35, NPRPS 36, NPRPS 37, NPRPS 36, NP		KB-pCOLA-II-FW	TGACAATTAATCATCGGCTCG	pJW62
NRIPS-31, NRIPS-38, NRPS-30) nel3 CEMEGETER/CACCURGETTATACTER/GOCCACUAGEGAG P. Ammensions TT01 NRPS-30, NRPS-38, NRPS-30, NRPS-38, NRPS-41, NRSS-38, NRPS-41, NRSS-38, NRSS-30, NRSS-38, NRSS-30, NRSS-38, NRSS-41, NRSS-38, NRSS-40, NRSS-30, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS,40, NRSS,40, NRSS-40, NRSS-40, NRSS-40, NRSS-40, NRSS,40, NRSS-	pNA27 (NRPS-31_NRPS-33	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	pJW62
NNH-5-39/ PNA28 (NRPS-38, NRPS-37, NRPS-34, NRPS-37, NRPS-37, NRPS-37, NRPS-30, NRPS-30, NRPS-30, NRPS-37, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30, NRPS-30,	NRPS-34, NRPS-35,	na53	CGAGCTGACTGCAGCTATCTCAGTCGCGCCACAGGGAG	P. luminescens TTO1
pNA28 (NEPE-32, NEPS-38, NEPS-37) ma3L_FV mask_FV mask_FV (NEPS-36, NEPS-38, NEPS-37) rest mask_FV mask_FV mask_FV (NEPS-36, NEPS-38, NEPS-37) rest mask_FV mask_FV mask_FV (NEPS-37) rest mask_FV mask_FV (NEPS-36, NEPS-38, NEPS-37) rest mask_FV mask_FV (NEPS-37) rest mask_FV mask_FV (NEPS-37) rest mask_FV (NEPS-36, NEPS-38, NEPS-37) rest mask_FV (NEPS-37) rest mask_FV (NEPS-30, NEPS-36, NEPS-37) rest mask_FV (NEPS-30, NEPS-36, NEPS-37) rest mask_FV (NEPS-30, NEPS-36, NEPS-37) rest mask_FV (NEPS-30, NEPS-36, NEPS-37) rest mask_FV (NEPS-30, NEPS-36, NEPS-31, NEPS-31, NEPS-36, NEPS-31, NEPS-31, NEPS-36, NEPS-31, NEPS-31, NEPS-36, NEPS-31, NEPS-31, NEPS-31	NRPS-39)	na54	CGTTTTCGAGCTGCGCAACCAGGTTGTAAGCTTGGCGAGCAAAGG	P. luminescens TTO1
pNA28 (NRPS-34, NRPS-35, NRPS-34, NRPS-36, NRPS-37) ma34_FW TeachATTATIONTOGGETCs pCDF, analad nRS5 9.AAGTT3GGTCTLACGAALGAGCAACGGCGAACAAGGGGA P. Luminescens TTO1 nRS6 CGAGCGGAIGATTAATTGTCACGCACCCCCCCCTCCCCTC		na33_RV		pCDF_ara/tacl
NRPS-34, NRPS-36, NRPS-37) na65 GAAGTTGCGTCTCACGAAGACAGCACAGCGCCACAGGGGA P. Iuminescents TTO1 NRPS-37) ne88 CGAGCCCATGATTALTIGTCACAGGGCCACCGCGCTCAC P. Iuminescents TTO1 NRPS-37) ne88 CGAGCCCATGATTALTIGTCACAGGGCCATCGCGCTCAC P. Iuminescents TTO1 NRPS-37, NRPS-38, NRPS-31, NRPS-38, NRPS-41, NRPS-38, NRPS-41, NRPS-38, NRPS-41, NRPS-38, NRPS-41, NRPS-38, NRPS-41, NRPS-39, NRPS-31, NRPS-38, NRPS-41, NRPS-39, NRPS-34, NRPS-38, NRPS-41, NRPS-42, K&pCOLAHRW TGACGTGGCAACCGGGTTGTCAGGAACGGCCAAAGG X. zemetimal DSMI6338 MAAG CGAGCTGGCAACCGGGCAACGGCCACAGGGGCAAAGG X. zemetimal DSMI6338 X. zemetimal DSMI6338 NRPS-41, NRPS-42, NRPS-42, NRPS-38, NRPS-42, NRPS-39, NRPS-42, NRPS-39, NRPS-42, NRPS-34, NRPS-42, NRPS-44, NRPS-42, NRPS-44, NRPS-42, NRPS-44, NRPS-42, NRPS-44, NRPS-42, NRPS-44, NRPS-42, NRPS-44,	pNA28	na34_FW	TGACAATTAATCATCGGCTCG	pCDF_ara/tacl
NRPS-37) ne66 CGAGCCCATEATTALTITECTACAGCGCCCCCCCTCAC P. Anviouscents TTO1 PNA29 KB-pACYC-IFW AACGAGAAGGAGGAATTAAAATCG p.IV61 na57 GCTAAACGGAGGAATTAACAACGG p.IV61 na57 GCTAACGGAGGAATTCACTAACCGCGGCGAAATG X. zeenimmai DSMI6338 NRPS-40, NRPS-56,	NRPS-34, NRPS-36,	na55	GAAGTTGCGTCTCACGAACAGCAAGCGCCACAAGGGGA	P. luminescens TTO1
PNA29 КВ-рАСУС-8-FW ААССАССТВО САТОРАТОР p.NM61 narr GCTACCAGEGGGAATTCCTCCTGTTAGC p.NM61 narr GCTATTCACCAGEGGAATTCCTCCTGTTAGC p.NM61 narr GCTATTCACCAGEGGAATTCCTCCTGTTAGC p.NM61 narr GCTATTCACCAGEGGAATTCCTCCTGTTAGC x. sevenemen 50M1638 NRPS-41, NRPS-36, NRPS-41, NRPS-32, NRPS-41, NRPS-42, rds8 GCATTTAATCATCGCGCTCG p.NM62 NRPS-41, NRPS-32, NRPS-41, NRPS-34, NRPS-42, rds9 CGACTTGCCCACACGGTTATATGCTGAACCAGGGAAACG X. sevenemen 50M1638 NRPS-41, NRPS-34, NRPS-42, NRPS-34, NRPS-42, nas9 CGACTTGCCCACACAGGTTATATGCTGAACCACGGGAAACG X. sevenemen 50M1638 NRPS-42, NRPS-34, NRPS-42, NRPS-34, NRPS-42, nas9 CGACGTGCCACACAGGTTATATGCTGAACCACAGGGAAA X. sevenemen 50M1638 NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, nas9 CGACGCGATGATTCACCCTGTTACCA p.NM61 PNA35 nas9 CGACGCGATGATTCACCCTGTTACCA p.NM61 X. sevenement 50M1638 PNA35 nas9 CGACGCGATGATTCACCCTGTTACCC p.NM61 X. sevenement 50M1638 PNA35 nas9 CGACGGCGATGATTCACCGACCGCCCGCGAACAGGTGAAAAA X. sevenement 50M1638	NRPS-37)	na56	CGAGCCGATGATTAATTGTCACAGCGCCTCCGCTTCAC	P. luminescens TTO1
pNA29 KB-pACYC-HRV CATGGAATTCCTCCTGTTACC p,WB1 nB57 GCTAACAGGAGGGAATTCCATGAAAGGTAGTATTGCTAAAAGGGAGATG X. szenkimaki DSM16338 nB58 GGATTTAATTGCTGCTCTGTTATATGCTGAAGGGGGAAATG X. szenkimaki DSM16338 NRPS-30, NRPS-36, NRPS-36, NRPS-36, NRPS-41, NRPS-42 TGGAGTGGCGCAAGGGGGTGG p,WR2 NRPS-41, NRPS-42 GGAGTGGCGCAACCAGGTTATAATGCTGAGGGGGAAACG X. szenkimaki DSM16338 NRPS-41, NRPS-32, NRPS-38, NRPS-43, NRPS-43, NRPS-44, NRPS-42 GGAGGTGGCGCAACCAGGTTATAATGCTGAGGGGGAAACG X. szenkimaki DSM16338 NRPS-42, NRPS-39, NRPS-44, NRPS-42, NRPS-43, NRPS-44, NRPS-42, NRPS-43, NRPS-44, NRPS-4		KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
pNA29 nstr GCTAACAGGAGGAATTCCATGAAAGGTAGTATTGCTAAAAGGGAAATTG X. szentimuii DSM16338 ns58 CGATTTTAATTCGTGCTGCGGCGGGAAATG X. szentimuii DSM16338 pNA30 (NRPS-30, NRPS-36, NRPS-41, NRPS-42) TGACAATTAATCATCGGGTGCGAAGTGGCAAGGGGGAAAT p.WK2 ns59 CGAGTGGGCAAGCAGGTTATAATGCTGACGGGGAAAG X. szentimuii DSM16338 NRPS-41, NRPS-32, NRPS-32, NRPS-33, NRPS-42, NRPS-39, NRPS-42, NRPS-39, NRPS-42, NRPS-39, NRPS-42, NRPS-39, NRPS-42, NRPS-39, NRPS-42, NRPS-39, NRPS-42, NRPS-30, NRPS-42, NRPS-43, NRPS-42, NRPS-43, NRPS-42, NRPS-43, NRPS-42, NRPS-30, NRPS-42, NRPS-43, NRPS-42, NRPS-43, NRPS-44, NRPS-44, NRPS-42, NRPS-44, NRPS-44, NRPS-44, NRPS-44, NRPS-44, NRPS-44, NRPS-		KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
natisCGATITIAATICCTCCTICTGTATATGCTGAGGGGAAATGX szerrifmeil DSM16338PNA30 (NRPS-30, NRPS-36, NRPS-41, NRPS-42)KB-pCCLAI-IFWTGGAGTGGGGTATGCGAGTCGGGCAACGGp.W62ne60CGAGCTGACGCAGCTGGGGGTATCTGGAGGGGAAACGX szerrifmail DSM16338PNA31 (NRPS-32, NRPS-33) NRPS-41) NRPS-42)m660CGAGGTGGGGCACCGGGTATGCGAGGGGAAACGX szerrifmail DSM16338pNA31 (NRPS-42, NRPS-41) NRPS-42)KB-pACYCI-IFWCATGGAATGCGCGCTCGGCGCAACGGGGATGCGCAACGGGGAAACGX szerrifmail DSM16338pNA31 (NRPS-42)ne61AAAACGAAGTIGGCGTCTCACGAACAGGAGTGCCACAAGGTGAAAX szerrifmail DSM16338NRPS-42)ne61AAAACGAAGTIGGCGTCACGAACAGGAGTGCCACAAGGTGAAAX szerrifmail DSM16338NRPS-42)ne62CGAGGCGAACGGCGCCGCCGp.W62ne64TGCAATTAATCATCGGCTCGp.W62pNA35KB-pACYC-FWGGAAGTGGCGCAACCAGGTGAACAAGTCGGGCGACCACTACX szerrifmail DSM16338pNA35NRPS-42, NRPS-44,	pNA29	na57	GCTAACAGGAGGAATTCCATGAAAGGTAGTATTGCTAAAAAGGGAGATG	X. szentirmaii DSM16338
pNA30 (NRPS-30, NRPS-36, NRPS-41, NRPS-42) KB-pCOLA-II-RV radio TGACAATTAATCATCGGCTCG pJWE2 NRPS-41, NRPS-42) na59 CGAGCTGACTGCAGCTGCAGCTGG pJWE2 NRPS-41, NRPS-42) na69 TGGAGCTGCAGCAGCAGGGCAACCG X. szendifmail DSMH6338 NRPS-41, NRPS-42) na69 TGGAGCTGCACACCAGGTTATATGCTGCAGCGGCAACG X. szendifmail DSMH6338 NRPS-40, NRPS-49, NRPS-40, NRPS-41, NRPS-42) KB-pCVC-II-FW AACCGAAAGGGGAGAATTAAATCG pJWE1 pNA31 (NRPS-40, NRPS-41, NRPS-42) na61 AAACCGAAGGGGAGATTAAATCG pJWE1 pNR95-40, NRPS-41, NRPS-42) na61 AAACCGAAGGTGGCTCACCAGGAGGTGGCAACAAGGTGAAA X. szendifmail DSMH6338 pNR95-42) na61 AAACCGAAGGTGGAGCTCACCTACGGAGGTGAACAATATTATGTACTGTGTGTG		na58	CGATTTTAATTCCTCCTTCTCGTTATAATGCTGACGGGCAAATG	X. szentirmaii DSM16338
pNA30 (NPRS-30, NPRS-30, NRPS-42, NRPS-41, NRPS-42)KB-pCOLA-H-RV Ind9CGAGCTGACCGAGCTATCTCAGAATCCCCACAAGGGGAGAX. szentimai DSM16338NRPS-41, NRPS-42, NRPS-44, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-42, NRPS-44, NRPS-42, NRPS-44, <b< td=""><td></td><td>KB-pCOLA-II-FW</td><td>TGACAATTAATCATCGGCTCG</td><td>pJW62</td></b<>		KB-pCOLA-II-FW	TGACAATTAATCATCGGCTCG	pJW62
(NRPS-30, NRPS-36, NRPS-41, NRPS-42) na69 CGAGCTGACGAGCAGCAGGTATCTCAGAATCCCCAAGGGAGA X. szentirmail DSM1633 NRPS-41, NRPS-42) na60 TCGAGCTGCGCAACCAGGTTATAATGCTCACGGGCAACGA X. szentirmail DSM1633 NRPS-42, NRPS-39, NRPS-40, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-40, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-41, NRPS-42, NRPS-42, NRPS-42, NRPS-41, NRPS-42, NRPS-42, NRPS-42, NRPS-43, NRPS-42, NRPS-44, NRPS-44, NRPS-44	pNA30	KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	pJW62
INCOM, NUCCE na80 TCGAGCTGGCGAACCAGGTTATATGCTGACGGGCAACG X. ezentirmair DSM16338 pNA31 (NRPS-32, NRPS-30, NRPS-40, NRPS-41, NRPS-42) KB-pACYC-II-RV AAAGAAAGAGGGGAGTTAAAATGG pJW61 na62 CGAGCTGCGCAACCAGGAGGAACTAAAATGG pJW61 na62 CGAGCCGATGCTCCACGAAGGTGCCACAAGGTGAAA X. ezentirmair DSM16338 na62 CGAGCCGATGATTAATGCTCGGGCCG pJW62 pNA35 ra62 CGAGCCGATGATTAATGCTGCGGCCG pJW62 pNA35 ra68 TAACGAAGTGGAGCTGCAGCTGG pJW62 na68 TCGCATTAATCATCGGGCCGC pJW62 X. bovienii SS2004 na68 TCGCATTAACCAGGACCTGGAACAATTAAGCGGGCACACACGCATGC X. bovienii SS2004 na68 TCGCATTCTCGGGGAAACAAGGGGCAACAACGCAGCATGCAT	(NRPS-30, NRPS-36, NRPS-41 NRPS-42)	na59	CGAGCTGACTGCAGCTATCTCAGAATCCCCACAAGGGGAGA	X. szentirmaii DSM16338
pNA31 (NRPS.32, NRPS.34), NRPS.40, NRPS.41, NRPS.42) KB-pACYC-II-FW (KB-pACYC-II-RV na61 AAAGAAAGTGGGGGTTGGGAACAGGAACTAAAAATGG pJW61 na62 CGAGCCGATGATTGGGTTGGGAACAGGAACAGGAAGTGAAA X. szentirmai DSM16338 X. szentirmai DSM16338 na62 CGAGCCGATGATTAATGTGCAACAGGAGGTGCCAAAGGTGAAA X. szentirmai DSM16338 X. szentirmai DSM16338 pNA35 KB-pCOLA-II-RV TGACAATTAATCATCGGCTCG pJW62 na68 TAACGAGCTGACGCGGCGCACCGGGTGGGGAAAGTAGG X. szentirmai DSM16338 pNA55 na68 TAACGAGCTGACGCGGCGCGCGCGGCGCACCACCA X. bovieni SS2004 na69 TICGTTTTCGAGCTGGCGCAACCAGGTTATAGCCGCGCACCCACC	Niti 0 41, Niti 0 42)	na60	TCGAGCTGCGCAACCAGGTTATAATGCTGACGGGCAAACG	X. szentirmaii DSM16338
PNA31 (NRPS-32, NRPS-34), NRPS-41, NRPS-42)KB-pACYC-IRVCATGGAATTCCTCCGTGTAGCp.W61NRPS-41, NRPS-42)na61AAAACGAAGTTGCGGTCTCAGGAACAGGAGTTGCCACAGGGGGAAAX. szentirmail DSM16338NRPS-42)na62CGAGCCGATGATTAATTGTCAAATATTATTACTATATTGTCACTCGTGTCACCAX. szentirmail DSM16338PNA35KB-pCOLA-IRVTGAGATGCGGCGCGCGGCGGCGGGGGGGGGGGGGGGGGG		KB-pACYC-II-FW	AACGAGAAGGAGGAATTAAAATCG	pJW61
(NHPS-32, NHPS-39, NHPS-31, NHPS-41), NHPS-40, NHPS-41, NHPS-40, NHPS-41, NHPS-40, NHPS-41, NHPS-4	pNA31	KB-pACYC-II-RV	CATGGAATTCCTCCTGTTAGC	pJW61
NRPS-42) nase CGAGCCGATGATTAATTGTCAAATATTATTACTATATTGTATTCCTCTGTACCA X. szentimmaii DSM16338 pNA35 KB-pCOLA-IF.FW TGACAATTAATCATCGGCTCG p.WV62 pNA35 TAACGAGCTGACGCTGCGGCTACCCGCTGGTAAAGTAG X. bowienii SS2004 na68 TAACGAGCTGACGCAGCTATCTACAGGCAGCACCCACCACCACCACCACCACCACCACCACC	(NRPS-32, NRPS-39, NRPS-40, NRPS-41,	na61	AAAACGAAGTTGCGTCTCACGAACAGGAGTTGCCACAAGGTGAAA	X. szentirmaii DSM16338
NA35 KB-pCOLA-II-FW TGACAATTAATCATCGGGCTCG pJW62 nB68 TAACGAGCTGACTGCAGCTAGCTCG pJW62 nB69 TICGTTTTGGAGCTGCAGCTAGCTAGCAGCTAGCTAGCACCACGACTAACGTAG X. bovienii SS2004 pNA59 KB-pACYC-FW GAGATGCAAGCGTGAAGCACAAGTTAATGCAGCGCGAACCATTAAGGCAAAGATCGCCAATTCAGCCTTGGGTAA GAGATCCAAGCCTACAAGTAAAACAGAAAGATTGACAATTAATGCACGCAATTCAGCCTTGTGGTAA GAGATCCAAGCCTACAAGTGGAAATTCATCGCGCATTCGGCCAACGCAATTCAGCCTTTTTCGGTAA GAGATCCAAGGAGGAATTCCATCGCTTGTTTAAGCAATTAATCATCGGCAATTCAGCCTTTTTCGGTAA ATTCCCCTCTCTGTTGATGGAATTCCTCCTGTTAGCCATTCAGCCTTGGCTGG pCK_0402 pNA59 KB-pACYC-RW TGCACGGAGGAATTCCATGGGATAACATTTAAGGCAAAGATCGCCCACGCCTTGGATAACGAATTCG X. bovienii SS2004 na125_FW CCAAACAGGAGGGAATTCCATGGGTGCCAAGCAAACAATTCAGCCCTTGATAACGAGC CCCTTCCAGCATGCAAGGCCGCGTGCCAAAGCAAACGAACTTCGCGCCCTTGATAACGAGC TGGCGACGTATTCATGGAGCATTTAACTGAGGGCGGTGCCAAGGGAATTCAAGGAGC TGGCGACGATGTCTGTGGCGAGCCATTTAATCATCGCGCGCCCTGATAACGAGCG TGGCGACGACGCTGTTTGCGAGCATTTAATCATCGCGCGCCCTGAAAGCGG pCOLA_ara/aacl pCOLA_ara/aacl pCOLA_ara_axtpS _Lacl_JW jw0138_FW CGCGGCGCGGATGACAGCGGAGCCAGCGGAAACGGGAATTCCATGAAGGAGGG CCTGCCAGAACCAGCAGCGGAAGCCGAGCGGAACCGGGAATTCCATGAAGGAAG	NRPS-42)	na62	CGAGCCGATGATTAATTGTCAAATATTATTTACTATATTGTATTCCTCTGTACCA	X. szentirmaii DSM16338
pNA35 KB-pCOLA-II-RV TGAGATAGCTGCAGCTCGG pJW62 na68 TAACGAGCTGCAGCTGCAGCTATCTCAGAAACTCCGGTCGGT		KB-pCOLA-II-FW	TGACAATTAATCATCGGCTCG	pJW62
pNA35 na68 TAACGAGCTGACTGCAGCTGCAGCTACAGGAAACTCCGGGTAAAGTAG X. bovienii SS2004 na69 TIGGTTTICGAGCTGCGCAACCAGGTTAAAGCCGGCACCACTAC X. bovienii SS2004 ppNA59 KB-pACVC-FW GAACAGTTAAAACGAAGCCTACAAGTGACAATTAAAGCAAGC		KB-pCOLA-II-RV	TGAGATAGCTGCAGTCAGCTCG	pJW62
na69ITCGTITTCGAGCTGCGAACCAGGTIATAGCCGCGAACCACTACX. bovieni SS204pNA59 pNA59 (NRPS-47, NRPS-48)KB-pACYC-RVGAACAGTTAAAACAGAAGCGTGAACAATTAAAGCAAAAGACTGGCCCAATTCAGCGCTGG GGAATCGCTTCTGCTTTAACTGTTGGATGCGCTGG AATTCCTCCTTTTAACTGTTGGATGACGAATTCATCGGCCTG GGAATCGCAATTCAGCGCTGGpCK_0402pNA59 (NRPS-47, NRPS-48)mat25_FWGCTAACAGGAGGAATTCAGGGCTGGCATTCAGCGATTCAGGCCTTTTCGATTTT AATTCCTCCTTTTAACTGTGGCGCGCGCCAGGAGGAATTCAACGGAC CAATTGAACAAGAGCGGCGCGCGCTAGTTAAACGAGACTGCGCGCCCCTGATAACGGC Mat126_RVCAGTTTAAACAGAAGACGGCGCGCGCCCCTGGC AGCGTGCGCGTGCCAAGGCTTTCAATGCGCCCCCGCCCCTGATAACGGC CCCTGTCAGCACTACTCAGGCGCTTTAACTCGCGCGCCCCCTGATAACGGC PCOLA_ara/taclpCOLA_ara/tacl pCOLA_ara/taclpNA60 (NRPS-47)KB-pCOLA-RV TGGCAGCGCGCGCGCGCGCGCGCGCGCGCGCCCAGGAAACGG (NRPS-47)CACTGGCGGTGCGACGCGCGCCCCAGGAACGGG CCCTGTCAGCACTACAAGACTGGCGCTTCAGGCCTTCAGGCCC ACGCGGCTGCGAGCGCGCGCGCCCCAGGAACGG AACGAGCTGCGGCAGCGGAGCCAGCGGAAGCGG AACGAGCTGCGGCAGCGGAGCCAGCGGAGCCCAGCGGCGCCCCAGAAAGG pCOLA_ara/taclpCOLA_ara/tacl pCOLA_ara/taclpCOLA_ara_xtpS _CCCLA_gAB _UW0136_RVCGCGGCGGGGCGCGCGCGCGCGCCCCCAGAAAGGGAATTCCCTGGTAGGCAATTAATCCTCGGCCCCCA ATGCGCAAAAAGG CCACGGGTATGGAGAACAGTGGCAATGCGAACGGGCAGCGGGCGCCCCCAGAAGGGCCCCCA ATGCGCAGAACCAGGAGGCGGGAGCCAGCGGGAGCCAGCGGGCGCCCCCAGAAAGGGCCCCCA ATGCGCCAGAACCGGGAGCCAGCGGAGCCGGCGCGCCCCCACAAGGGCGCCCCCA ACGGGCTGTGACAATpCOLA_ara/tacl X. nematophila ATCC 19061 X. ne	pNA35	na68	TAACGAGCTGACTGCAGCTATCTCAGAAACTCCGGTCGGT	X. bovienii SS2004
pNA59 (NRPS-47, NRPS-48) KB-pACYC-FW (B-pACYC-RV GAACAGTTAAAACAGAAGCGTGAACAATTAAAGCAAAAGATCGCCAATCTGCGTAA GGAGATCGCAAGCGAAGCG		na69	TTCGTTTTCGAGCTGCGCAACCAGGTTATAGCCGCGCACCACTAC	X. bovienii SS2004
pNA59 (NRPS-47, NRPS-48)KB-pACYC-RVITCACCCTTCTGTTTTCGTTGCGTATGGAATTACGCAATTCAGCCTTTTTCGATTTT AATTCCTCCTTTCTGTTAGGAATTCCTCCGTGTAGGpCK_0402na125_FWGCTAACAGGAGGAATTCCATGGAATTCCTGGGCCTCGX. bovienii SS2004na126_RVCAGATTTTAAACAGAGGCGCGTAGTTTAATCATCGGCGGCCCCCGGGGGAATTAACAATCGX. bovienii SS2004pNA60 (NRPS-47)KB-pCOLA.RVCATTGACAAGAGGCGCGCTATGTTATAACGGCGCGCCCAAGGGAAATCGGAAACGGGCCAAGGGCAATTAACAACGGpCOLA_ara/taclpCOLA_ara127_FWAACGAGCTGACTGACGCAGCTGTTTGCCAGGCGCGCGCGGGGGCCAAGGGGAATTAAAAAGGGpCOLA_ara/taclpCOLA_ara2,rbp _tacl_JWjw0136_FWCGCTGCTGGTGGAGGAAACAGGAGGAGGAGAAGGGGAATTCCATGGAAGGGGpCOLA_ara/taclpCOLA_ara2,rbp _tacl_JWjw0137_RVAACGGGTATGGAGAAACAGTAGAAGGTGGGATACAGGGAGAATTCCATGAAAGGAGATGGCx. nematophila ATCC 19061x. nematophila ATCC 19061 2. nematophila ATCC 19061 2. nematophila ATCC 19061 2. nematophila ATCC 19061x. nematophila ATCC 19061x. nematophila ATCC 19061pCOLA_ara_gxpS _tacl_JWjw0160_RWGGGCTAACAGGAGGAATTCCATGAAAGGAGCAGGGCAAGCGGCAAAAGGAAAGGGAAATTGGCpCOLA_ara/taclpCOLA_ara_gxpS _tacl_JWjw0160_RWGGGCTAACAGGAGGAATTCCATGAAAAGGAGCTTGGCTAAAAAAGGGCAAATTGGCpCOLA_ara/taclpCOLA_ara_gxpS _tacl_JWjw0160_RWGGGCTAACAGGAGGAATTCCATGGAAGAGAGGGCAAGGGAATTGGCCP. luminescens TT01		KB-pACYC-FW		pCK_0402
INTRODUCTION </td <td>nNA59</td> <td>KB-pACYC-RV</td> <td></td> <td>pCK_0402</td>	nNA59	KB-pACYC-RV		pCK_0402
na126_RVCAGATTTTAAAACAGAGCCGCTATGTTTATAAACGAGAAGGAAG	(NRPS-47, NRPS-48)	na125_FW	GCTAACAGGAGGAATTCCATGGATAACATTCTGGCCTCG	X. bovienii SS2004
kB-pCOLA-FW CATTGACAAGAGCTGCGTGCCAACGAAACGAACTTCGGCCCCTTGATAACGAGC TGACTGCAGCTATCTCATGACAATTAATCATCGGCCCCCTTGATAACGAGC TGACTGCAGCTATCTCATGCACAATTAATCGTCGGCGCCCAAGGACTTCAGGTCCA CGCTCTTCAGCAATGAACAATGGAATTACTCGGCGGCCAAGGGCTTTCAGGTCCA CGCTCTCAGCATAGAACATGGAATTCCTCCTGTTAGC pCOLA_ara/tacl pCOLA_ara/tacl na127_FW AACGAGCTGACTGCAGCGCTGCCCAAGGCCCAAGGCTTTCAGGTCCA CGCTCTTCAGCATAGAACATGGAATTCCTCCTGTTAGC x. bovienii SS2004 na128_RV ATACGAGCCGATGATTGACAATTAATCGTCAGCTCCAACAC X. bovienii SS2004 pCOLA_ara_xtpS _tacl_JW jw0136_FW CGCTGCTGGTTCTGGCGATTGACAATTAATCATCGGCTCG pCOLA_ara/tacl ACGGGTATGGAGAAACAGTAGGAGAACAGTAGGAGAGTTGCGATAAAAAGCG pCOLA_ara/tacl X. nematophila ATCC 19061 AL-GxpS-2-1 ACTGTTTCTCCTGCAGGAGCCAGCGGGAGCCAGCGGGCGCCCTTACAGGCGCCCTCCA ATGGCTAAAAAGG X. nematophila ATCC 19061 JW_1acl_PStI_FW _tacl_PStI_FW CTGCAGGAGCCTGTTGACAAT pCOLA_ara/tacl JW_1acl_PstI_FW CTGCAGGAGCCGGGAGCCAGCGGGAGCCAGCGGCGCCCTTACAGGCGCCTCCA X. nematophila ATCC 19061 JW_1acl_PstI_FW CATGGAATTCCTCCTGTTAGCC pCOLA_ara/tacl X. nematophila ATCC 19061 pCOLA_ara_gxpS _tacl_JW jw01024_RV CATGGAATTCCTCCTGTTAGCAAT pCOLA_ara/tacl pw0160_RW GATTAATTGTCAACAGGAGGCAGCAGCAGCAGCAGCAGCAGCAGCAGCAG		na126_RV	CAGATTTTAAACAGAGCCGCTATGTTT <u>ATAACGAGAAGGAGGAATTAAAATCG</u>	X. bovienii SS2004
pNA60 (NRPS-47)KB-pCOLA-RVTGGCACGCCGCACTCTTTTGCAATGGCATTTAACTCGCGGTCCAAGGCTTTCAGTTCA CGCTCTTCAGCATAGAAACATGGCATTTAACTCGCGCGCCAGAGGCGTTCAGTTCA CGCTCTTCAGCATAGAACATGGCATTTAACTCCCGGGCCCAGAAGGGpCOLA_ara/taclpCOLA_ara128_RVAACGAGCCGATGATTAATTGTCAATCCACCAGCTCCAACACX. bovienii SS2004pCOLA_ara_xtpS _tacl_JWjw0136_FWCGCTGCTGGTTCTGGCGATTGACAATTAATCATCGGCTCGpCOLA_ara/taclpCOLA_ara_xtpS _tacl_JWjw0137_RVAACGGGTATGGAGAAACAGTAGAGAGGTGCGATAAAAAGCGpCOLA_ara/taclAL-GxpS-2-1ACTGTTTCTCCCATACCCGTTTTTTTGGGCTAACAGGAGGAATTCCATGAAAGATAGCA ATGGCTAAAAAGGGACTGGTTAAAAAGGX. nematophila ATCC 19061AD64TCGCCAGAACCAGCAGCGGAGCCAGCGGAGCCAGCGGATCCGGCGCGCCTTACAGCGCCTCCAA CX. nematophila ATCC 19061X. nematophila ATCC 19061pCOLA_ara_gpSS _tacl_JWjw0160_RWGGGTAAACAGGAGGGAATTCCATGAAGAGAGGAGATTGCGCPCOLA_ara/taclPCOLA_ara/taclpCOLA_ara_gpSS _tacl_JWjw0160_RWGATTAATTGTCAACAGCTCCTGCAGGCGAGATAGGAGAGGCTTTGTTGGCP. luminescens TT01		KB-pCOLA-FW		pCOLA_ara/tacl
(NRPS-47) na127_FW AACGAGCTGACTGCAGCTACCAGCTACTCACGGCGCAGAAACGG X. bovienii SS2004 na128_RV ATACGAGCCGATGATTAATTGTCAATCCACCGGCTCCAACAC X. bovienii SS2004 pCOLA_ara_xtpS _tacl_JW jw0136_FW CGCTGCTGGTTCTGGCGATTGACAATTAATCATCGGCTCG pCOLA_ara/tacl AL-GxpS-2-1 ACCGGGTATGGAGAAACAGTAGGAGGAGTTGCGATAAAAAGCG pCOLA_ara/tacl X. nematophila ATCC 19061 AL-GxpS-2-1 ACCGGCTGACTGCAGCAGCAGCGGAGCCAGCGGATCCGGCGCGCCTTACAGCGCCTCCAA X. nematophila ATCC 19061 X. nematophila ATCC 19061 JW_tacl_PstL_FW CTGCAGGAGCTGTTGACAAT CTGCAGGAGCCAGCGGAGCCAGCGGATCCGGCGCGCCTTACAGCGCCTCCAA PCOLA_ara/tacl pCOLA_ara_gxpS _tacl_JW jw0164_RV CATGGAATTCCTCGTGTAGCAGCAGCAGCAGCAGCAGCAGAAAAGGAAAGGAAATTGCT P. luminescens TT01	DNA60	KB-pCOLA-RV	TIGGCACGCAGCTATTCTATCGCCAGCCGGTCCAAGGCTTTCAGTTCA	pCOLA_ara/tacl
na128_RVATACGAGCCGATGATTAATTGTCAATCCACCAGCTCCAACACX. bovienii SS2004pCOLA_ara_xtpSjw0136_FWCGCTGCTGGTGTCTGGCGATTGACAATTAATCGTCGGCTCGpCOLA_ara/tacljw0137_RVAACGGGTATGGAGAAACAGTAGAGAGGTTGCGATAAAAAGCGpCOLA_ara/taclAL-GxpS-2-1ACTGTTTTCCCATACCGGTTTTTTGGGCTAACAAGGAGATTCCATGAAAGATAGCX. nematophila ATCC 19061AD64TCGCCAGAACCAGCAGCGGAGCCAGCGGATCCGGCGCGCCTTACAGCGCCTCCAX. nematophila ATCC 19061JW_tacl_Pstl_FWCTGCAGGAGCTGTTGACAATpCOLA_ara/taclpCOLA_ara_gpxSjw0124_FWGGGCTAACAGGAGCTGCTGCAGCAGCAGCAGCAGCAGCAGACAGTAGGCAAAGAGAAATTATCP. luminescens TTO1pCOLA_ara_ggxDSjw0160_RWGATTAATTGTCAACAGCTCCTGCAGGCAGATAGAGACGTTTGTTGGCP. luminescens TTO1	(NRPS-47)	na127_FW	AACGAGCTGACTGCAGCTATCCCA <u>CGGCCGCCAGAAACGG</u>	X. bovienii SS2004
pCOLA_ara_xtpS jw0136_FW CGCTGCTGGTTCTGGCGATTGACAATTAATCATCGGCTCG pCOLA_ara/tacl jw0137_RV AACGGGTATGGAGAAACAGTAGAGAGGTGCGATAAAAAGCG pCOLA_ara/tacl _tacl_JW AL-GxpS-2-1 ACTGTTTCTCCATACCCGTTTTTTGGGCTAACAGGAGGAGATTCCATGAAAGATAGC ATGGCTAAAAAGGG X. nematophila ATCC 19061 AD64 TCGCCAGAACCAGCAGCGGGAGCCAGCGGATCCGGCGCGCCTTACAGCGCCTCCA C Y. nematophila ATCC 19061 JW_tacl_PStl_FW CTGCAGGAGCTGTTGACAAT pCOLA_ara/tacl jw0064_RV CATGGATTCCTCCTGTTAGCC pCOLA_ara/tacl pCOLA_ara_gxpS _tacl_JW jw0160_RW GGGTTAAACAGGCAGCTCGAGGCGGAGCCAGCGGCAGCTTGTGGC P. luminescens TT01		na128_RV	ATACGAGCCGATGATTAATTGTCA <u>ATCCACCAGCTCCAACAC</u>	X. bovienii SS2004
pCOLA_ara_xtpS _tacl_JW iw0137_RV AACGGGTATGGAGAAACAGTAGAGAGTTGCGATAAAAAGCG pCOLA_ara/tacl AL-GxpS-2-1 ACTGTTTCTCCATACCCGTTTTTTGGGCTAACAGGAGGAGTTCCATGAAAGATAGC ATGGCTAAAAAGGG X. nematophila ATCC 19061 AD64 TCGCCAGAACCAGCAGCGGAGCCAGCGGAGCCAGCGGCCTTACAGCGCCTCCA C X. nematophila ATCC 19061 JW_tacl_Pstl_FW CTGCAGGAGCTGTTGACAAT pCOLA_ara/tacl jw0064_RV CATGGATTCCTCCTGTTAGCC pCOLA_ara/tacl pCOLA_ara/tacl pCOLA_ara/tacl pCOLA_ara/tacl jw0164_RV GGGCTAACAGGAGGAATTCCATGAAAGGATAGCATGGCTAAAAAGGAAATTATC P. luminescens TTO1 pCOLA_ara_gxpS _tacl_JW jw0160_RW GATTAATTGTCAACAGCTCCTGCAGGCAGATAGAGACGTTTGTTGGC P. luminescens TTO1		jw0136_FW	CGCTGCTGGTTCTGGCGATTGACAATTAATCATCGGCTCG	pCOLA_ara/tacl
_tacl_JW AL-GxpS-2-1 ACTGTTTCTCCATACCCGTITTTTTGGGCTAACAGGAGGAATTCCATGAAAGATAGC ATGGCTAAAAAGGG X. nematophila ATCC 19061 _AD64 TCGCCAGAACCAGCAGCGGAGCCAGCGGAGCCAGCGGCGCCTTACAGCGCCTCCA C X. nematophila ATCC 19061 JW_tacl_Pstl_FW 2 CTGCAGGAGCTGTTGACAAT pCOLA_ara/tacl jw0064_RV CATGGAATTCCTCGTGTAGCC pCOLA_ara/tacl pCOLA_ara_gxpS _tacl_JW jw0124_FW GGGCTAACAGGAGGGAATTCCATGACAGCATGGCTAAAAAGGAAATTATC P. luminescens TTO1 pw0160_RW GATTAATTGTCAACAGGCTCCTGCAGGCAGACGAGAGAGA	nCOLA ara vtnS	jw0137_RV	AACGGGTATGGAGAAACAGTAGAGAGTTGCGATAAAAAGCG	pCOLA_ara/tacl
AD64 TCGCCAGAACCAGCAGCAGCGGAGCCAGCGGAGCCAGCGGATCCGGCGCGCCTTACAGCGCCTCCA X. nematophila ATCC 19061 JW_tacl_Pstl_FW CTGCAGGAGCTGTTGACAAT pCOLA_ara/tacl jw0064_RV CATGGAATTCCTCCTGTTAGCC pCOLA_ara/tacl pCOLA_ara_gxpS jw0124_FW GGGCTAACAGGAGGGAATTCCATGAAAAGGAAAGGAAAG	_tacl_JW	AL-GxpS-2-1		X. nematophila ATCC 19061
JW_tacl_Pstl_FW CTGCAGGAGCTGTTGACAAT pCOLA_ara/tacl jw0064_RV CATGGAATTCCTCCTGTTAGCC pCOLA_ara/tacl pCOLA_ara_gxpS jw0124_FW GGGCTAACAGGAGGAATTCCATGAAAAGGAAAGGAAAGG		AD64		X. nematophila ATCC 19061
jw0064_RV CATGGAATTCCTCCTGTTAGCC pCOLA_ara/tacl pCOLA_ara_gxpS jw0124_FW <u>GGGCTAACAGGAGGAATTCCCATG</u> AAAGATAGCATGGCTAAAAAGGAAATTATC P. luminescens TTO1 _tacl_JW jw0160_RW <u>GATTAATTGTCAACAGGCTCCTGCAG</u> GCAGATAGGAGACGTTTGTTGGC P. luminescens TTO1		JW_tacl_PstI_FW	CTGCAGGAGCTGTTGACAAT	pCOLA_ara/tacl
pCOLA_ara_gxpS jw0124_FW GGGCTAACAGGAGGAATTCCATGAAAGGATAGCATGGCTAAAAAGGAAATTATC P. luminescens TT01 _tacl_JW jw0160_RW GATTAATTGTCAACAGCTCCTGCAGGCAGATAGGAGACGTTTGTTGGC P. luminescens TT01		∠ jw0064_RV	CATGGAATTCCTCCTGTTAGCC	pCOLA_ara/tacl
_tacl_JW jw0160_RW GATTAATTGTCAACAGCTCCTGCAGGCAGATAGAGACGTTTGTTGGC P. luminescens TT01	POUL A ara avos	jw0124_FW	GGGCTAACAGGAGGAATTCCATGAAAGATAGCATGGCTAAAAAGGAAATTATC	P. luminescens TTO1
	_tacl_JW	jw0160_RW	GATTAATTGTCAACAGCTCCTGCAGGCAGATAGAGACGTTTGTTGGC	P. luminescens TTO1
jw0151_FW/ GCCAACAAACGTCTCTATCTGCTGGATGAACACCG P. luminescens TT01		jw0151_FW/	GCCAACAAACGTCTCTATCTGCTGGATGAACACCG	P. luminescens TTO1
jw0161_RV <u>GATTAATTGTCAACAGCTCCTGCAG</u> TCACAGCGCCTCCGCTTCAC <i>P. luminescens</i> TT01		jw0161_RV	GATTAATTGTCAACAGCTCCTGCAG	P. luminescens TTO1

3 Supplementary Figures



Figure S1. A schematic representation of the xenotetrapeptide (1) producing NRPS (XtpS).



Figure S2. HPLC/MS data refers to Figure 2a (NRPS-1-4) of compound **1** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² of **1** (m/z [M+H]⁺ = 411.30). (c) EIC/MS² data of synthetic **1** (m/z [M+H]⁺ = 411.30).



Figure S3. HPLC/MS data refers to Figure 2b (NRPS-5) of compounds **2-5**, **33/34** and **35/36** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) Extracted ion chromatogram (EIC)/MS² of **35/36** (*m*/*z* [M+H]⁺ = 392.25). (c) EIC/MS² of **33/34** (*m*/*z* [M+H]⁺ = 358.27). (d) EIC/MS² of **2** (*m*/*z* [M+H]⁺ = 586.40). (e) EIC/MS² of **3** (*m*/*z* [M+H]⁺ = 600.41). (f) EIC/MS² of **4** (*m*/*z* [M+H]⁺ = 552.41). (g) EIC/MS² **5** (*m*/*z* [M+H]⁺ = 566.43). EICs of **2-5** are depicted with threefold increased intensity. (h) EIC/MS² of synthetic **2** (*m*/*z* [M+H]⁺ = 586.40).



Figure S4. HPLC/MS data refers to Figure 2b (NRPS-6) of compound **6** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) Extracted ion chromatogram (EIC)/MS² of **6** (m/z [M+H]⁺ = 556.35). (c) EIC/MS² of synthetic **6** (m/z [M+H]⁺ = 556.35).



Figure S5. HPLC/MS data refers to Figure 3a (NRPS-7) of compound **1** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) Extracted ion chromatogram (EIC)/MS² of **1** (m/z [M+H]⁺ = 411.30). (c) EIC/MS² of synthetic **1** (m/z [M+H]⁺ = 411.30).



Figure S6. HPLC/MS data refers to Figure 3a (NRPS-8) of compounds **2** and **4** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) Extracted ion chromatogram (EIC)/MS² of **2** (m/z [M+H]⁺ = 586.40). (c) Extracted ion chromatogram (EIC)/MS² of **4** (m/z [M+H]⁺ = 552.41). (d) EIC/MS² of synthetic **2** (m/z [M+H]⁺ = 586.40).



Figure S7. HPLC/MS data refers to Figure 3b (NRPS-9) of compounds **7**, **8** and **10** produced in *E. coli* DH10B::*mtaA.* (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) Extracted ion chromatogram (EIC)/MS² of **10** (m/z [M+H]⁺ = 457.34). (c) Extracted ion chromatogram (EIC)/MS² of **8** (m/z [M+H]⁺ = 570.42). (d) Extracted ion chromatogram (EIC)/MS² of **7** (m/z [M+H]⁺ = 556.41).



Figure S8. HPLC/MS data refers to Figure 3b (NRPS-10) of compounds **7-11** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) Extracted ion chromatogram (EIC)/MS² of **7** (*m*/*z* [M+H]⁺ = 556.41). (c) Extracted ion chromatogram (EIC)/MS² of **8** (*m*/*z* [M+H]⁺ = 570.42). (d) Extracted ion chromatogram (EIC)/MS² of **9** (*m*/*z* [M+H]⁺ = 584.44). (e) Extracted ion chromatogram (EIC)/MS² of **10** (*m*/*z* [M+H]⁺ = 457.34). (f) Extracted ion chromatogram (EIC)/MS² of **11** (*m*/*z* [M+H]⁺ = 471.35).



Figure S9. HPLC/MS data refers to Figure 3b (NRPS-11) of compounds **33/34**, **35/36** and **12** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data data of **33/34** (*m*/*z* [M+H]⁺ = 358.27). (c) EIC/MS² data of **35/36** (*m*/*z* [M+H]⁺ = 392.25). (d) Extracted ion chromatogram (EIC)/MS² of **12** (*m*/*z* [M+H]⁺ = 556.35).



Figure S10. A schematic representation of non-functional recombinant type S NRPSs using subunit 1 building blocks from AmbS XIdS and SzeS combined with XtpS subunit 2.



Figure S11. HPLC/MS data refers to Figure 3c (NRPS-13) of compounds **13**, **14**, **33/34** and **35/36** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogramm (BPC) of an exemplary culture extract. (b) EIC/MS² data of **13** (*m/z* [M+H]⁺ = 589.33). (c) EIC/MS² data of **14** (*m/z* [M+H]⁺ = 555.35). (d) EIC/MS² data data of **34** (*m/z* [M+H]⁺ = 358.27). (e) EIC/MS² data of **35/36** (*m/z* [M+H]⁺ = 392.25). (f) EIC/MS² data of synthetic **13** (*m/z* [M+H]⁺ = 589.33).



Figure S12. HPLC/MS data refers to Figure 3c (NRPS-14) of compounds **15**, **16**, **34** and **35/36** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogramm (BPC) of an exemplary culture extract. (b) EIC/MS² data of **15** $(m/z \text{ [M+H]}^+ = 634.38)$. (c) EIC/MS² data of **16** $(m/z \text{ [M+H]}^+ = 600.40)$. (d) EIC/MS² data of **34** $(m/z \text{ [M+H]}^+ = 358.27)$. (e) EIC/MS² data of **35/36** $(m/z \text{ [M+H]}^+ = 392.25)$. (f) EIC/MS² data of synthetic **15** $(m/z \text{ [M+H]}^+ = 634.38)$.



Figure S13. Comparison of production yields of a homologous *in cis* and *trans* NRPS-14. The colour code of the NRPS subunits is depicted at the bottom of the figure. The domain assignment is as in Figure 1 plus FT (formyltransferase, N-terminal triangle) and specificities are assigned for the entire A domains.



Figure S14. HPLC/MS data refers to Figure 3d (NRPS-15) of compounds **34**, **36** and **17** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogramm (BPC) of an exemplary culture extract. (b) EIC/MS² data of **34** (*m*/*z* [M+H]⁺ = 358.27). (c) EIC/MS² data of **36** (*m*/*z* [M+H]⁺ = 392.25). (d) EIC/MS² data of **17** (*m*/*z* [M+H]⁺ = 643.43). (e) EIC/MS² data of synthetic **17** (*m*/*z* [M+H]⁺ = 643.43).



Figure S15. HPLC/MS data refers to Figure 3d (NRPS-16) of compounds **18-21** and **36** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogramm (BPC) of an exemplary culture extract. (b) EIC/MS² data of **18** (*m*/*z* [M+H]⁺ = 830.54). (c) EIC/MS² data of **19** (*m*/*z* [M+H]⁺ = 844.55). (d) EIC/MS² data of **20** (*m*/*z* [M+H]⁺ = 858.57). (e) EIC/MS² data of **21** (*m*/*z* [M+H]⁺ = 810.57). (f) EIC/MS² data of **36** (*m*/*z* [M+H]⁺ = 392.25). (g) EIC/MS² data of synthetic **19** (*m*/*z* [M+H]⁺ = 844.55).



Figure S16. (a) Production of D/L-tripeptides exemplary of NRPS-5. The tripeptide production is related to the unpaired activity of GxpS subunit 2 resulted in the production of peptides **33/34** and **35/36**. The different epimers could be identified by their retention times. (b) Tripeptide **33/34** and **35/36** amounts and yields (determined in triplicates (n=3)) are given. The colour code of the NRPS subunits is depicted at the bottom of the figures. The domain assignment is as in Figure 1.



Figure S17. HPLC/MS data refers to Figure 4a (NRPS-20), Figure 4b (NRPS-21-23), Figure 4c (NRPS-24 and NRPS-25) and Figure 5 (NRPS-26-28) of compound 1 produced in *E. coli* DH10B::*mtaA*. (a) EIC/MS² (NRPS-20) of 1 (*m*/*z* [M+H]⁺ = 411.30). (b) EIC/MS² (NRPS-21-23) of 1 (*m*/*z* [M+H]⁺ = 411.30). (c) EIC/MS² (NRPS-24 and NRPS-25) of 1 (*m*/*z* [M+H]⁺ = 411.30). (d) EIC/MS² (NRPS-26-28) of 1 (*m*/*z* [M+H]⁺ = 411.30). (e) EIC/MS² data of synthetic 1 (*m*/*z* [M+H]⁺ = 411.30).



Figure S18. Sequence alignments of XtpS linker sequences. (a) XtpS T_2 - C_2 (XtpS 5086) and T_3 - C_3 (XtpS 8269) linker were aligned to the linker region excised from Dhbf crystal structure (Protein Database ID: 5u89). (b) XtpS A_2 - T_2 (XtpS 4826) and A_3 - T_3 (XtpS 8009) linker were aligned to the linker region excised from Dhbf crystal structure. Red dashed lines indicate SYNZIP insertion points.



Figure S19. Further examples of two component type S NRPS split in between and within RtpS modules.



Figure S20. Further examples of two component type S NRPS split within modules.



Figure S21. HPLC/MS data refers to Figure 6 (NRPS-28) of compound 1 produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of 1 (m/z [M+H]⁺ = 411.30).



Figure S22. HPLC/MS data refers to Figure 6 (NRPS-29) of compound **25** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **25** (m/z [M+H]⁺ = 538.40).



Figure S23. HPLC/MS data refers to Figure 6 (NRPS-30) of compound **22** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **22** (m/z [M+H]⁺ = 459.30).



Figure S24. HPLC/MS data refers to Figure 6 (NRPS-31) and (NRPS-34) of compounds **22** and **23** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **22** (m/z $[M+H]^+ = 459.30$). (c) EIC/MS² data of **23** (m/z $[M+H]^+ = 425.31$).



Figure S25. HPLC/MS data refers to Figure 6 (NRPS-32) of compound **24** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **24** (m/z [M+H]⁺ = 778.45).



Figure S26. HPLC/MS data refers to Figure 6 (NRPS-33) of compounds **2** and **4** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **2** (m/z [M+H]⁺ = 586.40). (c) EIC/MS² data of **4** (m/z [M+H]⁺ = 552.41).



Figure S27. HPLC/MS data refers to Figure 6 (NRPS-34) of compounds **2**, **3**, **4** and **5** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **2** (m/z $[M+H]^+ = 586.40$). (c) EIC/MS² data of **3** (m/z $[M+H]^+ = 600.41$). (d) EIC/MS² data of **3** (m/z $[M+H]^+ = 552.41$). (e) EIC/MS² data of **3** (m/z $[M+H]^+ = 566.43$).



Figure S28. HPLC/MS data refers to Figure 6 (NRPS-36) of compounds **2** and **3** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **2** (m/z [M+H]⁺ = 586.40). (c) EIC/MS² data of **3** (m/z [M+H]⁺ = 600.41).



Figure S29. HPLC/MS data refers to Figure 6 (NRPS-37) of compounds **25** and **26** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **25** (m/z $[M+H]^+ = 588.40$). (c) EIC/MS² data of **26** (m/z $[M+H]^+ = 552.41$).



Figure S30. HPLC/MS data refers to Figure 6 (NRPS-38) of compound **1** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **1** (m/z [M+H]⁺ = 411.29).



Figure S31. HPLC/MS data refers to Figure 6 (NRPS-39) of compounds **28**, **29**, **30** and **31** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **28** (m/z [M+H]⁺ = 826.45). (c) EIC/MS² data of **29** (m/z [M+H]⁺ = 840.47). (d) EIC/MS² data of **30** (m/z [M+H]⁺ = 792.47). (e) EIC/MS² data of **31** (m/z [M+H]⁺ = 806.48). (f) EIC/MS² data of synthetic **28** (m/z [M+H]⁺ = 826.45).



Figure S32. HPLC/MS data refers to Figure 6 (NRPS-40) of compounds **24** and **32** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **24** (m/z [M+H]⁺ = 778.45). (c) EIC/MS² data of **32** (m/z [M+H]⁺ = 792.47). (d) EIC/MS² data of synthetic **24** (m/z [M+H]⁺ = 778.45).



Figure S33. HPLC/MS data refers to Figure 6 (NRPS-41) of compounds **28** and **29** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **28** (m/z [M+H]⁺ = 826.45). (c) EIC/MS² data of **29** (m/z [M+H]⁺ = 840.47). (d) EIC/MS² data of synthetic **28** (m/z [M+H]⁺ = 826.45).



Figure S34. HPLC/MS data refers to Figure 6 (NRPS-42) of compound **28** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **28** (m/z [M+H]⁺ = 826.45). (c) E EIC/MS² data of synthetic **28** (m/z [M+H]⁺ = 826.45).



Figure S35. HPLC/MS data refers to Supplementary Figure 16 (NRPS-43) of compounds **37**, **38**, **39** and **40** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **37** (m/z [M+H]⁺ = 314.27). (c) E EIC/MS² data of **38** (m/z [M+H]⁺ = 328.29). (d) E EIC/MS² data of **39** (m/z [M+H]⁺ = 342.20). (e) E EIC/MS² data of **40** (m/z [M+H]⁺ = 455.38).



Figure S36. HPLC/MS data refers to Supplementary Figure 16 (NRPS-44) of compound **6** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **6** (m/z [M+H]⁺ = 556.35).



Figure S37. HPLC/MS data refers to Supplementary Figure 17 (NRPS-47) of compounds **41** and **42** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **41** (m/z [M+H]⁺ = 510.39). (c) E EIC/MS² data of **42** (m/z [M+H]⁺ = 496.37).



Figure S38. HPLC/MS data refers to Supplementary Figure 17 (NRPS-48) of compound **43** produced in *E. coli* DH10B::*mtaA*. (a) Base Peak Chromatogram (BPC) of an exemplary culture extract. (b) EIC/MS² data of **43** (m/z [M+H]⁺ = 500.37).

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