

APPENDIX A

PROXIMATE ANALYSIS

A.1 Moisture Content (AOAC, 1999)

Method

1. Dry the empty dish and lid in the oven at 105°C for 6 h and transfer to desiccator to cool (30 min). Weigh the empty dish and lid.
2. Weigh about 5 g of sample to the dish. Spread the sample with spatula.
3. Place the dish with sample in the oven. Dry for 16 h or overnight at 105°C.
4. After drying, transfer the dish with partially covered lid to the desiccator to cool. Reweigh the dish and its dried content.

Calculation

$$\% \text{ Moisture} = \frac{(W_1 - W_2) \times 100}{W_1}$$

Where: W_1 = weigh (g) of sample before drying

W_2 = weigh (g) of sample after drying

A.2 Ash Content (AOAC, 1999)

Method

1. The crucible and lid is firstly placed in the furnace at 550°C overnight to ensure that impurities on the surface of crucible are burn off. Cool the crucible in the desiccator (30 min).
2. Weigh the crucible and lid to 3 decimal places.
3. Weigh about 5 g sample into the crucible. Heat over low bunsen flame with lid half covered. When fumes are no longer produced, place crucible and lid in furnace.
4. Heat at 550°C overnight. During heating, do not cover the lid. Place the lid on after complete heating to prevent loss of fluffy ash. Cool down in the desiccator.

5. Weigh the ash with crucible and lid until turning to gray. If not, return the crucible and lid to the furnace for further ashing.

Calculation

$$\% \text{ Ash} = \frac{\text{Weigh of ash (g)} \times 100}{\text{Weigh of sample (g)}}$$

A.3 Protein Content (AOAC, 1999)

Reagents

1. Kjedahl catalyst: Mix 9 part of potassium sulphate (K_2SO_4) anhydrous, Nitrogen free with 1 part of copper sulphate ($CuSO_4$)
2. Sulfuric acid (H_2SO_4)
3. 40% NaOH solution (w/v)
4. 0.02N HCl solution
5. 4% H_3BO_3 solution (w/v)
6. Indicator solution: Mix 100 ml of 0.1% methyl red (in 95% ethanol) with 200ml of 0.2% bromocresol green (in 95% ethanol).

Method

1. Place sample (0.5-1.0 g) in digestion flask.
2. Add 5 g Kjeldahl catalyst, and 200 ml of conc. H_2SO_4 .
3. Prepare a tube containing the above chemical except sample as blank.
4. Place flasks in inclined position and heat gently until frothing ceases. Boil briskly until solution clears. Cool sample to a room temperature.
5. Place 250 ml-flask containing 50ml of 2% boric acid and a few drops of an indicator in the distillation unit with a tip of the condenser extending below the surface of acid solution.
6. Connect the digestion tube to the distillation unit. Heat until all NH_3 has distilled.

7. Remove receiver, wash tip of condenser, and titrate excess standard acid in distilled with standard NaOH solution.

Calculation

$$\% \text{ Protein} = \frac{(A-B) \times N \times 1.4007 \times 6.25}{W}$$

Where: A = volume (ml) of 0.02N HCl used sample titration

B = volume (ml) of 0.02N HCl used in blank titration

N = Normality of HCl

W = weigh (g) of sample

14.007 = atomic weigh of nitrogen

6.25 = the protein-nitrogen conversion factor

A.4 Fat Content (AOAC, 1999)

Reagents

1. Petroleum ether

Method

1. The bottle and lid is firstly placed in the incubator at 105°C overnight to ensure that weight of bottle was stable.
2. Weigh about 3-5 g of sample to paper filter and wrap.
3. Take the sample into extraction thimble and transfer into soxhlet
4. Fill petroleum ether about 250 mL into the bottle and take it on the heating mantle.
5. Connect the soxhlet apparatus and turn on the water to cool them and then switch on the heating mantle.
6. Heat the sample about 14 h. (heat rate of 150 drop/min).
7. Evaporate the solvent by using the vacuum condenser.
8. Incubate the bottle at 80-90 °C until solvent was completely evaporated and bottle was completely dry.
9. After drying, transfer the bottle with partially covered lid to the desiccator to cool. Reweigh the bottle and its dried content.

Calculation

$$\% \text{ Fat} = \frac{\text{Weigh of fat} \times 100}{\text{Weigh of sample}}$$

A.5 Chitin Content

Extraction of chitin

1. Cold 0.25 M HCl (300 ml) was added to 50.0 g thawed shrimp shells (not dried). This extraction was allowed to proceed for 5 min on ice.
2. The suspension was then filtered and additional 300 ml of cold 0.25 M HCl was added to the pellet. The supernatant was kept for later analysis.
3. After 35 min of cold extraction the suspension was filtered again. The supernatant was combined with the first one and the pellet was washed with water (300 ml).
4. The suspension was then filtered and the water from the washing procedure was added to the acid supernatants. The exact total volume of this acid extract was noted.
5. The extract was kept in a cold room until the content of calcium carbonate was determined by an Atomic Absorption Spectrophotometer.
6. The final pellet from the demineralisation step was extracted with NaOH (1 M, 100 ml) at 95 °C for 2 h.
7. The suspension was then cooled to room temperature, filtered and the pellet was extracted again under the same conditions (1 M NaOH, 100 ml, 95 °C) for 2 h.
8. The same filtering procedure was then repeated one more time and the final alkaline extraction was allowed to proceed for 1 h.
9. The extract was cooled to room temperature, filtered and washed with water until neutrality was achieved.
10. The pellet was finally washed with ethanol (96%) and dried at 80 °C. The content of chitin was determined gravimetrically.

APPENDIX B

MEDIA COPOSITION

B.1 Colloidal Chitin Agar Medium (Gomez et al., 2004)

Triammonium citrate	0.625	g
NaCl	0.250	g
KH ₂ PO ₄	0.375	g
MgSO ₄ .7H ₂ O	0.125	g
Na ₂ CO ₃	0.375	g
Agar	15	g
Colloidal chitin	20-50	g (wet weight)
Distilled water	1.0	l
pH	6.5 – 7.0	

B.2 Nutrient Agar Medium (Waksman, 1961)

Peptone	5.0	g
Beef extract	3.0	g
Sodium chloride	5.0	g
Agar	15.0	g
Distilled water	1.0	l
pH	6.8 – 7.2	

B.3 Bennets Agar (BNA) (Modi, 1993)

Glucose	10.0	g
Tryptone	1.0	g
Meat extracts	1.0	g
Yeast extracts	1.0	g

Agar	30.0	g
Distilled Water	1.0	l
pH	8	

B.4 Potato Dextrose Agar Medium (PDA) (Okon et al., 1977)

Potato	200.0	g
Glucose	20.0	g
Agar	15.0	g
Distilled water	1000.0	ml

B.5 Trace Salts Solution

FeS0 ₄ .7H ₂ O	0.1	g
MnCl ₂ .4H ₂ O	0.1	g
ZnS0 ₄ .7H ₂ O	0.1	g
Distilled Water	100. 0	ml

B.6 Tryptone-Yeast Extract Broth (ISP - 2) (Pridham and Gottlieb, 1948)

Bacto-Tryptone (Difco)	5.0	g
Bacto-Yeast Extract (Difco)	3.0	g
Distilled water	1.0	l
pH	7.0-7.2	

B.7 Oatmeal Agar Medium (ISP 3) (KUlster, 1959)

Oatmeal	60	g
Agar	12.5	g
Distilled water	1000	ml

B.8 Inorganic Salts-Starch Agar Medium (ISP 4) (Kuster, 1959)

Difco soluble starch	10.0	g
K ₂ HP0 ₄ (anhydrous basis)	1.0	g
MgS0 ₄ .7H ₂ O	1.0	g
NaCl	1.0	g
(NH ₄) ₂ S0 ₄	2.0	g
CaC0 ₃	2.0	g
Distilled water	1.0	L
Trace salts solution	1.0	ml
Agar (Difco)	20.0	g
pH	7.0-7.4	

B.9 Glycerol-Asparagine Agar Medium (ISP 5) (Pridham and Lyons, 1961)

L-asparagine	1.0	g
Glycerol	10.0	g
K ₂ HP0 ₄	1.0	g
Distilled water	1.0	l
Trace salts solution	1.0	ml
Agar (Difco)	20.0	g
pH	7.0-7.4	

B.10 Pridham and Gottlieb trace salts (Pridham and Gottlieb, 1948)

CuS0 ₄ .5H ₂ O	0.64	g
FeS0 ₄ .7H ₂ O	0.11	g
MnCl ₂ .4H ₂ O	0.79	g
ZnS0 ₄ .7H ₂ O	0.15	g
Distilled water	100.0	ml

B.11 Basal mineral salts agar (Pridham and Gottlieb, 1948)

(NH ₄)SO ₄	2.64	g
KH ₂ PO ₄	2.38	g
K ₂ HPO ₄ .3H ₂ O	5.65	g
MgSO ₄ .7H ₂ O	1.00	g
Trace salts	1.0	ml
Distilled water	1.0	l
Add agar	15.0	g
pH	6.8-7.0	

B.12 Carbon utilization medium (Pridham and Gottlieb, 1948)

1. Sterile carbon sources

Use chemically pure carbon sources certified to be free of admixture with other carbohydrates or contaminating materials.

Carbon sources: No carbon source (negative control)
 D-glucose (positive control)
 L-arabinose
 Sucrose
 D-fructose
 D-xylose
 Rhamnose
 I-inositol
 Raffinose
 D-mannitol
 Cellulose

2. Sterilize without heat by one of the following methods: Ether sterilization.

Weigh an appropriate amount of the dry carbon source and spread as a shallow layer in a pre-sterilized Erlenmeyer flask fitted with a loose cotton plug. Add sufficient acetone-free ethyl ether (C₂H₅)₂O to cover the carbohydrate.

Allow ether to evaporate at room temperature under a ventilated fume hood overnight or longer. When all ether has evaporated add sterile distilled water aseptically to make a 10% w/v solution of the carbon source.

3. Complete medium

Sterilize basal agar medium; cool it to 60'C and add sterile carbon source aseptically to give a concentration of approximately 1%. Agitate the mixture and pour 25ml of medium per dish into 9 cm Petri dishes. Each organism will require 2 Petri dishes with no carbon (as a negative control) plus duplicate plates for each carbon source tested.

B.13 Basal medium for Nitrogen source utilization

D-Glucose	1.0	g
MgSO ₄ .7H ₂ O	0.05	g
NaCl	0.05	g
FeSO ₄ .7H ₂ O	0.001	g
K ₂ HPO ₄	0.1	g
Agar	2.0	g
Distilled water	100	ml
Nitrogen source	0.1%	w/v
pH	7.0±2	

B.14 Luria agar (LA)

Ingredients Concentration

Tryptone	10.0	g
Yeast extract	5.0	g
Sodium chloride	5.0	g
Agar	18.0	g
PH	7.2	

APPENDIX C

REAGENTS AND BUFFER

C.1 Loading Dye

6x loading dye

Bromophenol blue	0.25	g
Sucrose in water	40.0	g (w/v)
Distilled water	100.0	ml

C.2 Ethidium Bromide

Ethidium bromide	10.0	mg
Distilled water	1.0	ml
Stored in dark bottle		

C.3 Agarose Gel

1% Agarose Gel (40 ml)

Agarose	400.0	mg
1x TAE	40.0	ml

C.4 TAE Buffer

50x TAE Buffer

Tris base	242.0	g
Glacial acetic acid	57.1	ml
0.5 M EDTA (pH 8.0)	100	ml

Total volume 1000 ml with double distilled water.

C.5 1M Tris, pH 8.0

Tris	121.1	g
Water	1.0	l
pH	8.0	

C.6 0.5 M EDTA, pH 8

EDTA	18.6	g
Water	100	ml
pH	8.0	

C.7 TE-Tris, pH 8

10X T-Tris

1 M Tris, pH 8.0	5	ml
0.5 M EDTA	1	ml
H ₂ O	44	ml

C.8 Colloidal Chitin (Berger and Reynolds, 1988)

1. Add 10g of chitin into 400 ml of concentrated HC1 and stirrer until completely dissolving.
2. Add distilled water and left overnight at 4°C.
3. Filtrate colloidal chitin and wash through the water to attain neutral pH.
4. Dissolve in distilled water prior to use.

C.9 Phosphate buffer

Prepare stock solutions.

2 M solution of monobasic sodium phosphate

NaH ₂ PO ₄ .H ₂ O	27.8	g
Distilled water	1000	ml

0.2 M solution of diabasic sodium phosphate

Na ₂ HPO ₄ .7H ₂ O	52.65	g
Distilled water	1000	ml

C.10 Preparation of Di-Nitrosalycyclic Acid (DNS) solution (Miller, 1959).

Distilled water 1416 ml

3-5 Dinitrosalycyclic Acid 10.6 g

NaOH 19.5 g

The above ingredients were dissolved gently in water bath at 80°C until a clear solution was obtained. Then the following chemicals were added.

Sodium potassium tartrate 300 g

Phenol (melted at 60°C) 7.5 ml

Sodium meta bisulphite 8.3 g

After dissolving the above ingredients, the solution was filtered through a large coarse sintered glass filter and stored at room temperature in an amber colored bottle to avoid photo oxidation.

C.11 Preparation of para-Di-Methyl Amino Benzaldehyde (DMAB)

1. Add 6.1 g of dipotassium tetraborate tetrahydrate in 100 ml of distilled water.
2. Add 1.5 ml of distilled water to 11.0 ml of concentrated HCl and made up to 100 ml with glacial acetic acid.
3. Add 10.0 g of DMAB in glacial acetic acid/HCl solution (10 ml of this solution was diluted to 100 ml with glacial acetic acid just before use.).

APPENDIX D

EXPERIMENT ANALYSIS

D.1 Reducing SugarAnalysis (DMAB Method)

1. Add 1.0 ml of 1.0% colloidal chitin in 50 mM phosphate buffer (pH 7.0) to test tube.
2. Add 1.0 ml sample and completely mix with vortex.
3. Incubate 50°C, 60 min.
4. Add 0.2 ml of boric acid solution and incubate exactly 3 minutes in boiling water.
5. Rapid cool in an ice-water bath and add 6.0 ml DMAB reagent.
6. Incubate 37°C, 20 min and immediately measure by spectrophotometer (Hitachi U-2010) at 544nm.
7. The boiled sample use as control sample and distilled water use as enzyme blank.

*One unit of enzyme activity equals to 1 μ M of reducing sugar released per minutes.

D.2 Reducing SugarAnalysis (DNS method).

1. Add 1.0 ml of 0.5% carboxyl methyl cellulose (CMC) in 50mM phosphate buffer (pH 7.0) to test tube.
2. Add 1.0 ml sample and completely mix with vortex.
3. Incubate 50°C, 60 min.
4. Add 3.0 ml of DNS reagent and develop color by boiling 5 min.
5. Rapid cool down at room temperature and add 6.0 ml DMAB reagent.
6. Incubate 37°C, 20 min and measure absorbance by spectrophotometer (Hitachi U-2010) at 540 nm.
7. The boiled sample use as control sample and distilled water use as enzyme blank.

*One unit (U) of enzyme activity was defined as the amount of enzyme which liberates 1 μ mol of glucose per min under the above assay conditions (Miller, 1959).

D.3 NAG Standard Curve

Construct a linear glucose standard curve using the absolute amounts of NAG ($\mu\text{g/ml}$) plotted against A_{540} .

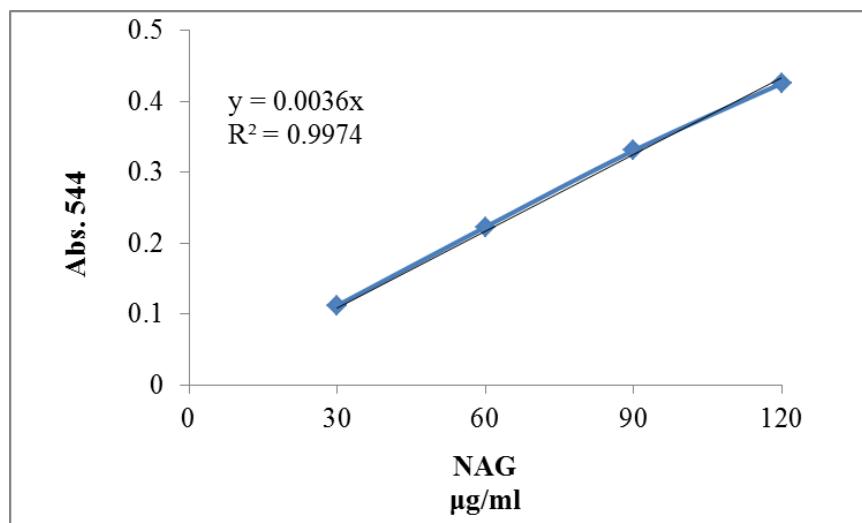


Figure D.1 Standard curve of reducing sugar by DMAB method using NAG as standard sugar

D.4 Glucose Standard Curve

Construct a linear glucose standard curve using the absolute amounts of glucose (mg/ml) plotted against A_{540} .

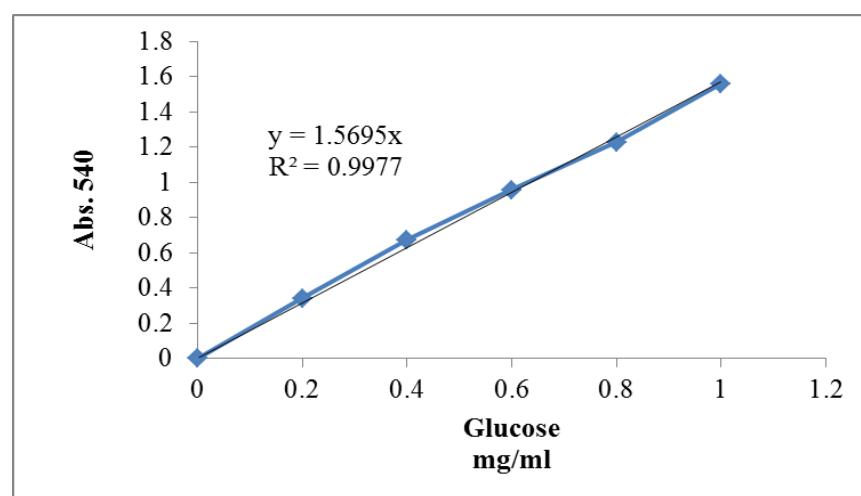


Figure D.2 Standard curve of reducing sugar by DNS method using glucose as standard sugar

APPENDIX E

MOLECULAR ANALYSIS

E.1 Method for DNA Extraction

1. Centrifuge cell at 13,000 rpm for a minute.
2. Discard the medium and wash the pellet twice times with 1ml sterile distilled water.
3. Re-suspend the pellet in 200 μ l Solution I (50mM Tris pH 8.0 with HCl, 10mM EDTA).
4. Add 4 μ l of lysozyme (1 mg/ml) and a few grams of acromopeptidase.
5. Incubate 37 °C, 30 min.
6. Add 20 μ l, 10% SDS and 200 μ l, 1x TE (pH 8) to make a final volume, 420 μ l.
7. Add equal volume of phenol: chloroform (1:1) and centrifuge at 13000 rpm for 15 min.
8. Transfer the upper aqueous phase into a new eppendorf tube.
9. Add double volumes of cold 99.5% EtOH and 40 μ l, Solution III (3.0M Potassium Acetate, pH5.5) and incubate -80 °C, for 20 min.
10. Centrifuge at 13000 rpm for 10 min at 4 °C
11. Discard the supernatant and wash the pellet with 700 μ l 70% EtOH.
12. Dry the pellet with vacuum pump.
13. Dissolve the pellet in 200 μ l, 1xTE buffer (pH 8.0) and add 5 μ l RNase solutions.
14. Incubate 37°C, for 30 min.
15. Replete the step 7-12 and dissolve the pellet in 10 μ l of sterilized distilled water (SDW).

E.2 PCR Amplification Method

1. Use the forward primer as 27f (5'GAGTTTGATCCTGGCTCAG-3') and reverse primer as 1525r (5'-AAGGAGGTGATCCAGCC-3') (Brosius et al., 1978).
2. Prepare the reaction mixture containing 1 μ l template DNA (50-200ng), 0.5 μ l each primer (10pmol/ μ l), 6.25 μ l Go-Taq DNA polymerase mixture (Promega), and 4.25 μ l sterile distilled water.
3. Set the PCR machine at an initial denaturation at 96°C for 4 min; 30 cycles of denaturation at 96°C for 30 s, annealing at 50°C for 30 s, extension at 72°C for 2 min; and a final extension at 72°C for 10 min.

E.3 Wizard®SV Gel and PCR Clean-Up System (Promega)

1. Cut the DNA fragment using a clean scalpel or razor blade. Transfer the gel slice to the weighed microcentrifuge tube and record the weight.
2. Add Membrane Binding Solution at a ratio of 10 μ l of solution per 10mg of agarose gel slice.
3. Vortex the mixture and incubate at 50–65°C for 10 min or until the gel slice is completely dissolved.
4. Centrifuge the tube briefly at room temperature to ensure the contents are at the bottom of the tube.
5. Place one SV minicolumn in a Collection Tube for each dissolved gel slice or PCR amplification.
6. Transfer the dissolved gel mixture or prepared PCR product to the SV minicolumn assembly and incubate for 1 min at room temperature.
7. Centrifuge the SV minicolumn assembly in a microcentrifuge at 14,000rpm for 1 minute.
8. Remove the SV minicolumn from the Spin Column assembly and discard the liquid in the Collection Tube. Return the SV minicolumn to the Collection Tube.
9. Wash the column by adding 700 μ l of Membrane Wash Solution, previously diluted with 95% ethanol, to the SV minicolumn.
10. Centrifuge the SV Minicolumn assembly for 1 min at 14,000rpm.

11. Empty the Collection Tube as before and place the SV minicolumn back in the Collection Tube. Repeat the wash with 500 μ l of Membrane Wash Solution and centrifuge the SV minicolumn assembly for 5 min at 14,000 rpm.
12. Remove the SV minicolumn assembly from the centrifuge, being careful not to wet the bottom of the column with the flow through. Empty the Collection Tube and re-centrifuge the column assembly for 1 min with the microcentrifuge lid open (or off) to allow evaporation of any residual ethanol.
13. Carefully transfer the SV minicolumn to a clean 1.5ml microcentrifuge tube.
14. Apply 50 μ l of Nuclease-Free Water directly to the center of the column without touching the membrane with the pipette tip.
15. Incubate at room temperature for 1 minute. Centrifuge for 1 minute at 14,000rpm.
16. Discard the SV mini-column and store the microcentrifuge tube containing the eluted DNA at 4°C or –20°C.

E.4 Gel Electrophoresis

1. Add agarose in 1X TAE buffer (0.04 M Tris-HCl, 0.04 M acetic acid, 0.001 M EDTA (pH 8.0)) and melt to make agarose gel.
2. Mix the samples with 6X loading dye (0.25% bromophenol blue, 0.25% xylene cyanol FF and 30% glycerol) at ratio 5:1.
3. Load sample and marker into agarose gel under 1X TAE buffer.
4. Set the electrophoresis at 100 V for 60 min.
5. Stain gel with ethidium bromide solution (0.1 mg/ml EtBr) for 10 min and de-stain with distilled water for 10 min.
6. Visual gel under UV light transillumination.

E.5 Sequencing Method

1. Use the primer 27f (5'-GAGTTGATCCTGGCTCAG-3'), primer 357f (5'CTCCTACGGGAGGCAGCAG-3'), primer 937r (5'-TTGGTGTGCTGTATGCTGTAAGT-3') and primer 1525r (5'-AAGGAGGTGATCCAGCC-3') (Rintala et al., 2001).
2. Add 1.0 µl sample, 1.0 µl primer (1.6pmol/µl), 1.5µl 5x Sequence buffer, 1.0µl premix, and 5.5 µl sterile distilled water in to PCR tube.
3. Set the PCR machine at an initial denaturation at 96°C for 1 min; 25 cycles of denaturation at 96°C for 10 s, annealing at 50°C for 5 s, extension at 60°C for 4 min.
4. Add 1.0µl 125mM EDTA, 1.0µl 3M Sodium Acetate, and 25µl 99.5%EtOH and place at room temperature in dark area for 15mins.
5. Centrifuge at 8000rpm for 15min at room temperature and discard the solution.
6. Add 35µl 70% EtOH and centrifuge at 12,000rpm for 10min at room temperature.
7. Discard the solution and dry in vacuum chamber.
8. Add 25µl HDF and completely mix.
9. Analysis in ABI PRISM 310 sequencer (Applied Biosystems, USA) by using the BigDye Terminator v3.1 Cycle Sequencing Kit (Applied Biosystems).

E.6 DNA-DNA hybridization Method (Ezaki et al., 1988).

1. Extract the chromosome DNA of *Streptomyces* sp. strain S4, reference strains; *S. fradiae* NBRC3360, *S. rubrolavendulae* NBRC13683 and *Escherichia coli*.
2. Denature and spot 5, 10, 15, and 25µg of the chromosome DNA on a Biodyne® Nylon Transfer Membrane
3. Bake the membrane at 80°C for 2 h.
4. Pre-hybridize at 72°C for 30 min with specific probe [(DIG)-High Prime DNA labeling kit (Boehringer)]
5. Hybridize with probe [(DIG)-High Prime DNA labeling kit (Boehringer)] at 72°C for overnight with gentle agitation specific.

6. Wash with 10 ml of 2xSSC, 0.1% SDS 10min at room temperature two times.
7. Add 100 ml blocking solution and incubate for 30 min with gentle agitation at room temperature.
8. Add 20 ml antibody solution and incubate for 30 min with gentle agitation at room temperature.
9. Add 100 ml washing buffer and wash two times for 20 min with gentle agitation at room temperature.
10. Add 20 ml detection buffer to equilibrate for 2-5 min.
11. Add color substrate solution and keep in the dark area during color development.
12. Scan and calculate %DDH by using NIH image software.

APPENDIX F

NUCLEOTIDE DATABASE

1. ORGANISM: *Streptomyces rubrolavendulae* NBRC 13683

```
1 gacgaacgct ggcggcgtgc ttaacacatg caagtcgaac gatgaaccca cttcggtggg
 61 ggatttagtgg cgaacgggtg agtaaacacgt gggcaatctg ccctgcactc tgggacaaggc
121 cctggaaacg gggctctaata ccggatacga ccacttcagg catctgatgg tggtgaaaag
181 ctccggcggt gcaggatgag cccgcggcct atcagctagt tggtgaggta acggctcacc
241 aaggcgcacga cgggttagccg gcctgagagg ggcgcggcc acactgggac tgagacacgg
301 cccagactcc tacgggaggc agcagtgggg aatattgcac aatgggcgaa agcctgatgc
361 agcgacgcggc cgtgagggtat gacggcccttc gggttgtaaa cctctttcag cagggaaagaa
421 gcgaaagtgta cggtagctgc agaagaagcg cggctact acgtgccagc agccgcggta
481 atacgttaggg cgcaagcggtt gtccggaaattt attggcgta aagagctgtt aggcggcctg
541 tcacgtcgga tgtgaaagcc cggggcttaa ccccgggtct gcattcgata cgggcaggct
601 agagttcggtt aggggagatc gaaattcctgt gtgtagcggtt gaaatgcgca gatatcgaga
661 ggaacacccgg tggcgaaggc gatatcttgg gccgatactg acgctgagga gcgaaagcg
721 ggggagcgaa caggattaga taccctggta gtccacgccc taaacgttgg gaacttagtg
781 tgggcgacat tccacgtcggtt ccgtgccgca gctaacgcata taagttcccc gcctgggag
841 tacggccgcac aggtctaaaac tcaaaggaat tgacggggc cgcgcacaagc ggcggagcat
901 gtggcttaat tcgacgcaac gcaagaacc ttaccaaggc ttgacatata cggaaacac
961 ccagagatgg gtgcggccctt gtggcggtt tacagggtgtt gcatggctgt cgtcagctcg
1021 tgcgtgaga tggtgggtt agtccgcac acgacgcac ccttgtcccg tggccagc
1081 agggccctgtt ggtgtgggg actcacggga gaccggggc gtcaactcg aggaagggtgg
1141 ggacgacgatc aagtcatcat gccccttatg tcttgggtct cacacgtgtt acaatggccg
1201 gtacaaagag ctgcataacc gcaagggtggc gcaaatctca aaaagccgtt ctcagttcg
1261 attggggctt gcaactcgac cccatgaagt cggagtcgtt agtaatcgca gatcagcatt
1321 gctgcgggtga atacgttccc gggccttggta cacaccgccc gtcacgtcac gaaagtcgtt
1381 aacacccgaa gccgggtggcc caaccccttg tgggaggag ctgtcgaagg tgggactggc
1441 gattgggacg aagtgcatac aaggttagccg taccggaaagg tgc
```

2. ORGANISM: *Streptomyces fradiae* NBRC 3439

```
1 ctggcggcgt gcttaacaca tgcaagtcga acgatgaacc cacttcggtg ggggatttagt
 61 ggcgaacgggg tgtagtaacac gtgggcaatc tgccctgcac tctggacaa gcccggaa
121 cggggcttaa taccggatac gaccacttca ggcattctgtt ggtgggtggaa agctccggcg
181 gtgcaggatg agccgcggc ctatcagcta gttgggtgagg taacggctca ccaaggcgac
241 gacgggttagc cggcttgaga gggcgaccgg ccacactggg actgagacac ggcccagact
301 cctacgggag gcagcagtgg ggaatattgc acaatgggcg aaagcctgtat gcagcgcacgc
361 cgcgtgaggg atgacggcct tcgggttggta aacctcttc agcaggaaag aagcgaaagt
421 gacggtagtgc gcagaagaag cgcggctaa ctacgtccca gcagccgcgg taatacgttag
481 ggcgcagcg ttgtccggaa ttattggcg taaagagctc gtggcgcc tgcgtacgtcg
541 gatgtgaaag cccggggctt aacccgggtt ctgcattcgat tacgggcagg ctagagttcg
601 gttagggaga tcggaattcc tgggttagcg gtgaaatcgat cagatatcg gaggaacacc
661 ggtggcgaag gcggatctt gggccgatac tgacgtgtt gacgaaagc gtggggagcg
721 aacaggatta gataccctgg tagtccacgc cgtaaacgtt gggacttagg tggggcgac
781 attccacgtc gtccgtcccg cagctaacgc attaagtcc cccctgggg agtacggccg
841 caaggctaaa actcaaagga attgacgggg gcccgcacaa gcggcggagc atgtggctt
901 attcgacgca acgcgaagaa ctttaccaag gcttgcacata caccggaaac acccagagat
961 ggggtcccccc ttgtggcggtt tgcgtacgtt gtcgtacgtt cgtgtcgat
```

1021 gatgttgggt taagtccgc aacgagcgca acccttgc tggcgttgc gcaggccctt
1081 gtgggtgctgg ggactcacgg gagaccgccc gggtaactc ggaggaaggt ggggacgacg
1141 tcaagtcata atgcccccta tgtcttgggc tgcacacgtg ctacaatggc cggtaaaaaag
1201 agctgcgata ccgcaagggtg gagcgaatct caaaaagccg gtctcagttc ggattgggg
1261 ctgcaactcg accccatgaa gtcggagtcg ctagtaatcg cagatcagca ttgctgcgg
1321 gaatacgttc ccggccctt tacacaccgc ccgtcacgtc acgaaagtgc gtaacaccgg
1381 aagccgggtgg cccaaccctt tgtgggaggg agctgtcgaa ggtggactg gcgattggga
1441 cgaagtcgta acaaggtacg cgtaccg

3. ORGANISM: *Streptomyces nogalater*

1 cgaacgctgg cggcgtgctt aacacatgca agtcgaacga tgaacctcct tcgggaggggg
61 attagtggcg aacgggtgag taacacgtgg gcaatctgcc ctgcactctg ggacaagccc
121 tggaaacggg gtctaatacc ggatacggc ctccaccgc tgggggggt tggaaagctc
181 cggcggtgca ggtgagccc gcggcctatc agttgttgg tgaggttaacg gctcaccag
241 ggcacgacgg gtagccggcc tgagagggcg accggccaca ctgggactga gacacggccc
301 agactcctac gggaggcagc agtggggat attgcacaat gggcggaaagc ctgatgcagc
361 gacgcccgtg gaggatgac ggccttcggg ttgtaaacct ctgcggcagc ggaagaagcg
421 aaagtgcacgg tacctgcaga agaagcgcgg gctaactacg tgccagcagc cggcgttaata
481 cgtagggcgc aagcgttgc cggattatt gggcgtaaag agctcgtagg cggcttgtca
541 cgtcgggtgt gaaagcccg ggcttaaccc cgggtctgca gtgcatacgg gcaggctaga
601 gttcggtagg ggagatcggg attcctgggt tagcgggtgaa atgcgcagat atcaggagga
661 acaccgggtgg cgaaggcggg tctctgggccc gatactgacg ctgaggagcg aaagcgtggg
721 gagcgaacag gattagatac cctggtagtc cacgcgttaa acgggtggca cttaggtgtgg
781 gcaacattcc acgttgtccg tgccgcagct aacgcattaa gtgccccggc tggggagtag
841 ggccgcaagg ctaaaactca aaggaattga cggggggccg cacaagcggc ggagcatgt
901 gcttaattcg acgcaacgcg aagaacctta ccaaggctt acatacaccg gaaagcatta
961 gagatagtgc ccccttgcgt gtcgggttac aggtgggtca tggctgtcgt cagctcgtgt
1021 cgtgagatgt tgggttaagt cccgcaacga ggcacaccct tggccgtgt tgccagcagg
1081 cccttgcgt gctggggact cacgggagac cggccgggtc aactcggagg aaggtgggg
1141 cgacgtcaag tcatacatgcc ctttatgtct tggctgcac acgtgtaca atggccggta
1201 caaagagctg cgataccgtg aggtggagcg aatctaaaa agccggctc agttcggatt
1261 ggggtctgca actcgacccc atgaagtcgg agtcgttagt aatgcgcagat cagcattgt
1321 gccgtgaata cgttccggg cttgtacac accggccgtc acgtcacgaa agtcggtaac
1381 acccgaagcc ggtggccaa ccccttgcgtt gaggaggtgc tgcggatgg gactggcgt
1441 tgggacgaag tcgtaacaag gtagccgtac cggaaagg

4. ORGANISM: *Streptomyces eurythermus*

1 cattcacgga gagtttgc tggcgtcagg acgaacgctg gcccgtgt taacacatgc
61 aagtcgaacg atgaacctcc ttggggaggg gattagtggc gaacgggtga gtaacacgt
121 ggcaatctgc ctttactctt gggacaagcc ctggaaacgg ggtctaatac cggatacag
181 cctccaaggc atcttggagg ttggaaagct cggcgggtga aggtggagcc cgcggccat
241 cagcttgcgt gtcgggtaat ggctcacca ggcacgcacg gtagccggc ctgagaggc
301 gaccggccac actgggactg agacacggcc cagactccta cgggaggcag cagtggggaa
361 tattgcacaa tggggcaaag cctgtatgc cgcacccgc tgagggatga cggcccttcgg
421 gttgtaaacc tcttcagca gggagaagc gaaagtgc gtagctgc gaaagcgc
481 ggcttaactac gtgcacgcag cccggtaat acgtaggcgc caagcgttgc cggaaattat
541 tggcgttaaa gagctcgtag gcccgttgc acgtcggtt gaaaagcccg gggcttaacc
601 ccgggtctgc agtcgatacg ggcaggctag agttcggtag gggagatcgg aattcctgtt
661 gtagcgggtga aatgcgcaga tatcaggagg aacaccgggt gcaaggcggg atctctgggg
721 cgatactgac gtcggaggc gaaagcgtgg ggagcgaaca ggattagata ccctggtagt
781 ccacggccgtaa acgggtggc actagggtgtg ggcaacattc cacgttgc gtcggcagc

841 taacgcatta agtccccgc ctggggagta cggccgcaag gctaaaactc aaaggaattg
901 acggggggccc gcacaagcgg cggagcatgt ggcttaattc gacgcaacgc gaagaacctt
961 accaaggctt gacatacacc gaaagcatt agagatagt ccccccattt ggtcggtgta
1021 caggtggtgc atggctgtcg tcagctcgta tcgtgagatg ttgggttaag tcccccaacg
1081 agcgcaaccc ttgtcccgta ttgccagcag gcccttgtgg tgctggggac tcacgggaga
1141 ccgcgggggt caactcgag gaaggtgggg acgacgtcaa gtcatcatgc cccttatgtc
1201 ttgggtcgca cacgtgctac aatggccgtt acaatgagct gcgataccgt gaggtggagc
1261 gaatctcaaa aagccgtct cagttcgat tgggtctgc aactcgaccc catgaagtgc
1321 gagttgctag taatcgcaga tcagcattgc tgccgtaat acgttcccg gccttgata
1381 caccgccccgt cacgtcacga aagtccgtaa caccgaagc cggtggccca accccttgc
1441 ggagggagct gtcgaaggtg ggactggcga ttgggacgaa gtcgtaccaa gtagccgta
1501 ccggaagggtg cggctggatc acctcccttc t

5. ORGANISM: *Streptomyces paradoxus*

1 caagtcgaac gatgaaccac ttccgtgggg attagtgccg aacgggtgag taacacgtgg
61 gcaatctgcc ctgcactctg ggacaagccc tggaaacggg gtctaataacc ggataactgat
121 catcttgggc atccaagggtg ttgcggaaagct ccggcggtgc aggatgagcc cgccgcctat
181 cagcttggtg gtgaggttagt ggctcaccaa ggcgacgcg ggtagccggc ctgagagggc
241 gaccggccac actgggactg agacacggcc cagactccta cgggaggcag cagtggggaa
301 tattgcacaa tggcgaaag cctgatgcag cgacccgcg tgagggatga cggccttcgg
361 gttgtaaacc tcttcagca gggagaagc gaaagtgcg gtacctgcag aagaagcgc
421 ggctaaactac gtgcggcagc cccggtaat acgttagggcg cgagcgttgc cccgaattat
481 tggcgtaaaa gagctcgtag gcggcttgc acgtcggtt tgaaagcccg gggcttaacc
541 ccgggtctgc agtcgatacg ggcaggctag agttcggtag gggagatcgg aattcctgtt
601 gtagcggtga aatgcgcaga tatcaggagg aacaccgtg gcaaggcgg atctctggc
661 cgataactgac gctgaggagc gaaagcgtgg ggagcgaaca ggattagata ccctggtagt
721 ccacgcccgt aacggtgggc actagggtgt ggcaacattc cacgttgcgtcc gtgcgcgac
781 taacgcatta agtccccgc ctggggagta cggccgcaag gctaaaactc aaaggaattg
841 acggggggccc gcacaagcgg cggagcatgt ggcttaattc gacgcaacgc gaagaacctt
901 accaaggctt gacatacacc gaaagcatt agagatagt ccccccattt ggtcggtgta
961 caggtggtgc atggctgtcg tcagctcgta tcgtgagatg ttgggttaag tcccccaacg
1021 agcgcaaccc ttgtcccgta ttgccagcag gcccttgtgg tgctggggac tcacgggaga
1081 ccgcgggggt caactcgag gaaggtgggg acgacgtcaa gtcatcatgc cccttatgtc
1141 ttgggtcgca cacgtgctac aatggccgtt acaatgagct gcgataccgt gaggtggagc
1201 gaatctcaaa aagccgtct cagttcgat tgggtctgc aactcgaccc catgaagtgc
1261 gagtcgctag taatcgcaga tcagcattgc tgccgtaat acgttcccg gccttgata
1321 caccgccccgt cacgtcacga aagtccgtaa caccgaagc cggtggccca accccttgc
1381 ggagggagct gtcgaaggtg ggactggcga ttgggacgaa gtcgtaccaa gtagccgta
1441 ccggaagg

5. ORGANISM: *Streptomyces intermedius*

1 aacgctggcg gcgtgcttaa cacatgcaag tcgaacgatg aagcccttcg ggggtggatta
61 gtggcgaacg ggtgagtaac acgtggcga tctgcctgc actctggac aagcccttgg
121 aacgggggtct aataccggat atgactgtcc accgcattt ggatgggtgt aagctccggc
181 ggtgcaggat gagccgcgg cctatcagct agttggtagt gtatggctc accaaggcga
241 cgacgggtag ccggcctgag agggcgcaccg gccacactgg gactgagaca cggcccgac
301 tcctacggga ggcagcagtg gggaaatattt cacaatggc gaaagcctga tgcagcgc
361 ccgcgtgagg gatgacggcc ttccgggtt aaacctttt cagcaggaa gaagcgaag
421 tgacggtacc tgcaagaagaa ggcgcggcta actacgtgc agcagccgc gtaatacgta
481 gggcgcaga gttgtccgga attattggc gtaaaagagct cgtaggcggc ttgtcacgtc
541 ggttgtgaaa gcccgggct taaccccggt tctgcgtcg atacggcag gctagatgt
601 ggttagggag atcggaaattc ctgggtgtac ggtgaaatgc gcagatatca ggaggaacac
661 cggtggcgaa ggcggatctc tggccgata ctgacgctga ggagcgaag cgtggggagc

721 gaacaggatt agataccctg gtagtccacg ccgtaaacgg tgggcactag gtgtggcaa
781 cattccacgt tgtccgtgcc gcagctaacf cattaagtgc cccgcctggg gagtacggcc
841 gcaaggctaa aactcaaagg aattgacggg ggcccgcaca agcggcggag catgtggctt
901 aattcgacgc aacgcgaaga accttaccaa ggcttgacat acaccggaaa gcatcagaga
961 tagtcccccc ctgtggtcg gtgtacaggt ggtgcacatggc tgtcgtcagc tcgtgtcgt
1021 agatgtggg ttaagtcccg caacgagcgc aacccttgtc ccgtgttgcc agcaggccct
1081 tgtggtgctg gggactcagc ggagaccgc ggggtcaact cgagggaaagg tggggacgac
1141 gtcaagtcat catgcccctt atgtcttggg ctgcacacgt gctacaatgg ccgttacaat
1201 gagctgcgt accgcgaggt ggagcgaatc tcaaaaagcc ggtctcagtt cgattgggg
1261 tctgcaactc gacccatga agtcggagtc gctagtaatc gcagatcagc attgctgcgg
1321 tgaatacgtt cccggccctt gtacacaccc cccgtcacgt cacgaaagtc ggtaaacaccc
1381 gaagccggtg gcccaaccccc ttgtgggagg gagctgtcga aggtggact ggcatggg
1441 acgaagtcgt aacaaggtag ccgtaccgg aaggt

6. ORGANISM: *Streptomyces gougerotii*

1 aacgctggcg gcgtgcttaa cacatgcaag tcgaacatg aagcccttcg gggtgattta
61 gtggcgaacg ggtgagtaac acgtgggcaaa tctgccttc actctgggac aagccctgg
121 aacggggctt aataccggat atgaccgtcc atcgcatggt ggatggtgta aagctccggc
181 ggtgcaggat gagccgcgg cctatcagct agttggtagt gtagtggctc accaaggcg
241 cgacgggttag ccggcctgag agggcgaccg gccacactgg gactgagaca cggcccgac
301 tcctacggga ggcagcagt gggaaatattt cacaatggc gaaagcctga tgcagcgc
361 ccgcgtgagg gatgacggcc ttccgggttgg aaacctttt cagcaggaa gaagcgaaag
421 tgacggtacc tgcagaagaa gcgcggctt actacgtcc acgagccgc gtaatacgt
481 gggcgcaagc gtttccggg attattggg gtaaaagagct ctagggcgc ttgtcacgt
541 gtttggaaa gcccgggct taaccccggt tctgcagtc atacggcag gctagagttc
601 gtttaggggag atcggattt ctgggttagc ggtgaaatgc gcagatataa ggaggaacac
661 cggtggcgaa ggcggatctc tggccgata ctgacgctga ggagcgaaag cgtggggagc
721 gaacaggatt agataccctg gtagtccacg ccgtaaacgg tgggcactag gtgtggcaa
781 cattccacgt tgtccgtgcc gcagctaacf cattaagtgc cccgcctggg gagtacggcc
841 gcaaggctaa aactcaaagg aattgacggg ggcccgcaca agcggcggag catgtggctt
901 aattcgacgc aacgcgaaga accttaccaa ggcttgacat acaccggaaa gcatcagaga
961 ttgtcccccc ctgtggtcg gtgtacaggt ggtgcacatggc tgtcgtcagc tcgtgtcgt
1021 agatgtggg ttaagtcccg caacgagcgc aacccttgtc ccgtgttgcc agcaggccct
1081 tgtggtgctg gggactcagc ggagaccgc ggggtcaact cgagggaaagg tggggacgac
1141 gtcaagtcat catgcccctt atgtcttggg ctgcacacgt gctacaatgg ccgttacaat
1201 gagctgcgtt accgcgaggt ggagcgaatc tcaaaaagcc ggtctcagtt cgattgggg
1261 tctgcaactc gacccatga agtcggagtc gctagtaatc gcagatcagc attgctgcgg
1321 tgaatacgtt cccggccctt gtacacaccc cccgtcacgt cacgaaagtc ggtaaacaccc
1381 gaagccggtg gcccaaccccc ttgtgggagg gggagctgtc gaaggtggga ctggcattt
1441 ggacgaagtc gtaacaaggat agccgtaccgg aaggt

7. ORGANISM: *Streptomyces jietaisiensis*

1 cggcgtgctt aacacatgca agtcaacgta tgaaccagct tcgggtgggaa tttgtggcg
61 acgggtgagt aacacgtggg caatctgccc tgcactctgg gacaaggccct ggaaacgggg
121 tctaataccg gatacaacca ctgaccgcattt ggtcgggtgg tgaggttagt gctcaccaag ggcacgc
181 ggatgagccc gcggcctatc agcttgggg tgaggttagt gctcaccaag ggcacgc
241 gtagccggcc tggaggccgc accggccaca ctggactga gacacggccc agactccatc
301 gggaggcgcg agtggggat attgcacaat gggcgaaagc ctgatgcgc gacgccc
361 gagggatgac ggccttcggg ttgtaaaccc ctggactga ggaagaagcg aaagtgc
421 tacctgcaga agaagcgccg gctaactacg tgccagcgc cgcggtaata cgtaggcgc
481 caagcgttgtt cggattt gggcgtaaag agctgtaga cggctgtca cgtcgggtt
541 gaaagcccg ggttaaccc cgggtctgca gtcgatacgg gcaggctaga gttcggtagg
601 ggagatcgaa attcctggg tagcggtgaa atgcgcagat atcaggagga acaccgggg

661 cgaaggcgga tctctggcc gatactgacg ctgaggagcg aaagcgtggg gagcgaacag
721 gattagatac cctgttagtc cacgccgtaa acggtggca ctaggtgtgg gcaacattcc
781 acgttgtccg tgccgcagct aacgcattaa gtccccgccc tgffffgatc ggccgcaagg
841 ctaaaactca aaggaattga cggggggcccg cacaagcgc ggagcatgtg gcttaattcg
901 acgcaacgcg aagaaccta ccaaggctt acatacaccc gaaagcatta gagatagtgc
961 cccccctgtg gtcgggtgtc aggtgggtca tggctgtcg cagctcggt cgtaagatgt
1021 tgggttaagt ccccaacga gcgcacccct tggccgtgt tgccagcaac tcttcggagg
1081 ttggggactc acgggagacc gccgggggtca actcggagga aggtggggac gacgtcaagt
1141 catcatgccc cttatgtctt gggctgcaca cgtgctacaa tgccgggtac aatgagctgc
1201 gataccgtga ggtggagcga atctcaaaaaa gccggctca gtcggattt gggctcgaa
1261 ctcgacccca tgaagtcgga gtcgctagta atcgcagatc agcattgtcg cggtgaatac
1321 gttcccgccc cttgtacaca ccgcccgtca cgtcacaaaa gtcggtaaca cccgaagccc
1381 gtggcccaac ccgcaaggga gggagcggtc gaagggtggga ctggcg

8. ORGANISM: *Streptomyces mashuensis*

1 agagtttgat cctggctca gacgaacgc ggcggcgtgc ttaacacatg caagtcgaac
61 gatgaaccc tcctcgggagg ggattagtgg cgaacgggtg agtaacacgt gggcaatctg
121 ccctgcactc tgggacaagc cctggaaacg gggcttaata ccggatacga cacgcgaccg
181 catggtccgc gtgtggaaag ctccggcggt gcaggatgag ccccgccct atcagctgt
241 tggtgaggtt atggctcacc aaggcgacga cgggtagccg gcctgagagg gcgaccggcc
301 acactgggac tgagacacgg cccagactcc tacgggaggc agcagtgggg aatattgcac
361 aatgggcgaa agcctgatgc agcgacgccc cgtgagggat gacggccctc ggggtgtaaa
421 cctctttcag cagggaaagaa gcgaaagtga cggtaacctgc agaagaagcg ccggctaact
481 acgtgccagc agccgcgtt atacgttaggg cgcaagcggtt gtccgaaatt attggcgta
541 aagagctcgat aggccgtt tcgcgtcgga tgtgaaagcc cggggcttaa ccccggtct
601 gcattcgata cggcaggct agagttcggt agggggagatc ggaattcctg gtgttagcggt
661 gaaatgcgca gatatcgga ggaacaccgg tggcgaaggc ggatctctgg gccgataactg
721 acgctgagga gcgaaagcgt ggggagcga caggattaga taccctggta gtccacgcgc
781 taaacgttgg gcactagggtg tggcaacat tccacgttgc cctgtccgc gctaacgcac
841 taagtcccc gcctggggag tacggccgcg aggctaaaac tcaaaggaat tgacggggc
901 ccgcacaagc agcggagcat gtggcttaat tcgacgcaac gcgaagaacc ttaccaaggc
961 ttgacatatac ccggaaacac tcagagatgg tgcccccgt tggtcggtt acaggtgtt
1021 catggctgtc gtcagctcggt gtcgttagat gttgggttaa gtcccgcaac gagcgcaccc
1081 cttgttctgt gttgccagca atcgcttcgg ggtgatgggg actcacagga gactgcggg
1141 gtcaactcggtt aggaaggtgg ggacgcgtc aagtcatcat gccccttatg tcttggctg
1201 cacacgtgtc acaatggccg gtacaatgag ctgcgtatcc gcggatgttgc gcaatctca
1261 aaaagccgtt ctcagttcggtt attggggctt gcaactcgac cccatgaagt tggagttgt
1321 agtaatcgca gatcagcatt gtcgcgttga atacgttccc gggcttgcgta cacaccggcc
1381 gtcacgttac gaaagtcggtt aacaccggaa gccggggcc caacccttgc ggagggagcc
1441 gtcgaaggtt ggactggcgaa ttgggacgaa gtcgttacaa ggttagccgtt ccggaaagggt
1501 cggctggatc acctcctt

9. ORGANISM: *Streptomyces rimosus* subsp. *rimosus*

1 gtcaggacg aacgctggcg gcgtgtttaa cacatgcaag tcgaacgtatg aagcccttcg
61 ggggtggatata gttggcgttac ggtgatgttgc acgtggccaa tctgccttc actctggac
121 aagcccttgcg aacggggctt aataccggat atgacacacgc accgcgttgc ctgtgtgtgg
181 aaagctccgg cgggtcgatgg tgagccgcg gcctatcgc ttgttgggtgg ggtatggcc
241 taccaaggcg acgcgggtt gcccggcttgc gagggcgacc gcccacactg ggactgagac
301 acggcccaga ctcctacggg aggcagcgtt gggaaatattt gcacaatggg cgcaagcctg
361 atgcagcgac gcccgttgc ggtatgttgc cttcggttgc taaaccttgc tcagcaggga
421 agaagcgaa gtcgcgttac ctgcgttgcgaa agcggccgtt aactacgttgc cagcagccgc
481 ggtatgttgc gggatgttgc aacccggggc ttaacccggc gtctgcattt gatacggc
541 cttgtcggtt cggatgttgc aacccggggc ttaacccggc gtctgcattt gatacggc

601 ggctagagtt cggtaggaga gatcggaaatt cctgggttag cggtgaaatg cgcatatc
661 aggaggaaca ccggggcgaa aggccgatct ctggggcgat actgacgctg aggagcgaaa
721 gcgtggggag cgaacaggat tagataccct ggtagtcac gccgtaaacg ttgggaaacta
781 ggtgtggcg acatccacg tcgtccgtgc cgcaaggtaac gcattaagtt ccccgctgg
841 ggagtacggc cgcaaggcta aaactcaaag gaattgacgg gggccgcac aagcggcgaa
901 gcatgtggct taattcgcg caacgcgaag aaccttacca aggcttgaca tacaccgaa
961 acctctggag acaggggccc cttgtggtc ggtgtacagg tggcatgg ctgtcgtag
1021 ctcgtgtcgt gagatgttgg gttaagtccc gcaacgagcg caacccttgt tctgtgttc
1081 cagcatgcct ttcggggta tggggactca caggagactg cgggggtcaa ctcggagaa
1141 ggtggggacg acgtcaagtc atcatgcccc ttatgtctt ggctgcacac gtgctacaat
1201 ggccggtaaa atgagctgcg ataccgcgag gtggagcgaa tctcaaaaag ccggtctcg
1261 ttcggattgg ggtctgcaac tcgaccccat gaagtcggag tcgctagtaa tcgcagatca
1321 gcattgctgc ggtgaataacg ttccgggccc ttgtacacac cgccgcac gtcacgaaag
1381 tcggtaaacac ccgaagccgg tggcccaacc cttgtggga ggaatcgac gaaggtggaa
1441 ctggcgattt ggacgaagtc gtaacaaggat agccgtaccg gaagg

10. ORGANISM: Streptomyces violaceusniger

1 aacacatgca agtcaacga tgaaccgggtt tcggccgggg attagtggcg aacgggttag
61 taacacgtgg gcaatctgcc ctgcactctg ggacaagccc tgaaaacggg gtctaataacc
121 gatatatgact gcccggca tggctgggtg gtggaaagct cccggcgtgc aggtgagcc
181 cccggcctat cagttgttgc gtgggggtat ggcctaccaaa ggccgacgacg ggtagccgc
241 ctgagagggc gaccggccac actgggactg agacacggcc cagactccta cgggaggcag
301 cagtggggaa tattgcacaa tggggcgaag cctgatgcag cgacgcccgg tgagggatga
361 cggccttcgg gttttaacc tcttcagca gggaaaagc gcaagtgcg gtacctgcag
421 aagaagcgcc ggctaactac gtgccagcag ccgcgttaat acgtaggcg caagcgttgt
481 ccggaattat tggcgtaaa gagctcgtag gccgctgtc gcgtcggatg tgaaagcccg
541 gggcttaact ccgggtctgc attcgatacg ggcaggctag agttcggtag gggagatcg
601 aattccttgtt gtagcggtga aatgcgcaga tatcaggagg aacaccgggtg gccaaggccg
661 atctctgggc cgatactgac gctgaggagc gaaagcgtgg ggagcgaaca ggattagata
721 ccctggtagt ccacccgta aacgttggga actagggtg ggcgacattc cacgttgtcc
781 gtgccgcagc taacgcatta agtccccgc ctggggagta cggccgcaag gctaaaactc
841 aaaggaattt acggggggcc gcacaagcgg cggagcatgt ggcttaattc gacgcacgc
901 gaagaacctt accaaggctt gacatacacc gggaaaaccct ggagacaggg tcccccttgt
961 ggtcggtgtt caggtgggtc atggctgtcg tcagctcgat tcgtgagatg ttgggttaag
1021 tcccgaacg agcgaaccc ttgttctgtt ttgccagcat gccttcggg gtgatgggg
1081 ctcacaggag actggccgggg tcaactcgga ggaagggtgg gacgacgtca agtcatcatg
1141 ccccttatgt ctgggctgc acacgtgcta caatggccgg tacaatgagc tgcgaaggcc
1201 tgaggtggag cgaatctcaa aaagccggtc tcagttcgga ttgggtctg caactcgacc
1261 ccatgaagtc ggagtcgcta gtaatcgacg atcagcattt ctgcgtgaa tacgttcccg
1321 ggccttgtaac acaccggcc tcacgtcacy aaagtcggta acacccgaag cccgtggccc
1381 aacccttgcg gaggagccg tcgaagggtgg gactggcgat tgggacgaag tcgtaacaag
1441 gtagccgtac cggaaagggtc gctggatca cctccttaaa

11. ORGANISM: Streptomyces ehimensis

1 cggcgtgctt aacacatgca agtcaacga tgaaggccctt cgggggtggat tagtggcgaa
61 cgggtgagta acacgtggc aatctgccct gcactctggg acaagccctg gaaacgggg
121 ctaataccgg atatgactac tgaccgcata gttgggtggta gaaagctccg cccggcgtgc
181 atgagccgc ggcctatcag cttgttgggtg gggatggcata gacggccacact gggactgaga
241 agccggcctg agagggcgac cggccacact gggactgaga cacggccacact cttcgatgg
301 gaggcagcag tggggatata tgcacaatgg gcaaaacccctt gatgcagcga cggccgtgta
361 gggatgcagg cttcggtt gtaaaacccctt ttcagcaggaa aagaagcgaa agtgcacggta
421 cctgcagaag aagcggccgc taactacgtg ccagcagccg cggtaataacg tagggcgc
481 gcgttgcgtt gattattgg gctgtaaagag ctcgtaggcg gcttgcgtcg tcggatgtta

541 aagcccgggg cttAACCCG ggTTTgcatt cgatacGGGC aggctAGAGt tcggtaaggG
601 agatcggaat tcctgggtGA gCGGtaaaATG CGCAGATAc AGAGGAAcA CCggTggcGA
661 aggCGGatCT ctggggcGat ACTgacGCTG aggAGCgAAa GCGTggggAG cGAACAGGAT
721 tagataccCT ggtAGTCCAC GCGGtaaAcG ttggGAactA GGTGtggcG acATTCCACG
781 tCGTCCGtGC CGCAGCTAAC GcattaAGtT cccccGCTGG ggAGTACGGC CGCAAGGCTA
841 aaACTCAAAG gaATTGACGG GGGCCCGcAC aAGCAGCgGA GcAtGTggCT taATTGACG
901 caACGcGAAG AACCTTACCA AGGCTTGACA tacaccGGAA acGGCCAGAG atGGTcGCC
961 CCTTGTGGTC GGTGtACAGG TGGTGCATGG CTGTCGTcAG CTCGTGTcGT gagATGTGG
1021 GTTAAGTCCC GCAACGAGCG CAACCCTTGT CCTGTGTcGC CAGCATGCC tTCGGGGTGA
1081 tGGGGACTCA CAGGAGACTG CGGGGGTCAA CTcGGAGGAA GGTGGGGACG ACgtCAAGTC
1141 ATCATGCCCC TTATGTCTG GGCTGCACAC GTGCTACAAt GGCGGTACA ATGAGCTGCG
1201 ATGCCGTGAG GTGGAGCGAA TCTAAAAAG CCGGTCTAG tTCGGATTGG GGTCTGCAAC
1261 TCGACCCCAT GAAGTTGGAG TTGCTAGTAAC TCGCAGATCA GCATTGCTGC GGTGAATAcG
1321 tTCCCgggCc TTGTACACAC CGCCCGTcAC GTCACGAAAG TCGGTAACAC CGGAAGCCGG
1381 TGGCCCAACC CNTTGTGGAG GGAGCCGTcG AAGGTGGG

12. ORGANISM: Streptomyces cinnamoneus

1 acgaacGcTG GCGGCGTgCT TAACACATGc aAGTcGAACG ATGAAGCCt TCggggGTGGA
61 ttagtggcGA acgggtGAGt aACACGTGGG CAATCTGCC tTCActCTGG GACAAGCCt
121 ggAAACGGGG TCTAATACCG GATAcGACCT GCGAGGcAT CTCGGCGGtT ggAAAGGCTCC
181 ggcGGTGAAG GATGAGCCCG CGGCCTATCA GCTTGTGGT GGGGTAATGG CCTACCAAGG
241 CGACGACGGG TAGCCGGCCT GAGAGGGCGA CGGGCCACAC TGGGACTGAG ACACGGCCCA
301 GACTCCTACG GGAGGCAGCA GTGGGGAAATA TTGcACAAATG GGCgAAAGCC TgATGcAGCG
361 acGCCGCGTg AGGGATGACG GcCTTcGGGT TGTAAACCTC tTCAGcAGG GAAGAAGCGA
421 GAGTGAcGGT ACCTGcAGAA GAAGCgCCGG CTAACtACGT GcAGCAGCC GCGGTAAATAC
481 GTAGGGCGCA AGCttGTCC GGAATTATTG GGCgTAAAGA GCTCGTAGGc GGCTTGTGc
541 GTCGGATGTG AAAGCCCCGG GCTTAACCCc GGGTCTGcAT TCGATAcGGG CAGGCTAGAG
601 tTCGGTAGGG GAGATCGGAA TtCCTGGTGT AGCggGTAAA TGCGCAGATA TCAggGAGGAA
661 CACCGGTGGC GAAGGCGGAT CTCTGGGCCG ATACTGACGc TGAGGAGCGA AAGCgtGGGG
721 AGCGAACAGG ATTAGATAcc CTGGTAGTCC ACGCCGTAAC CGTTGGAAc TAGGTGTGGG
781 CGACATTCCA CGTCGTCGT GCGCAGCTA ACGCATTAAG TtCCCGCCT GGGGAGTACG
841 GCGCAGGC TAAAActCAA AGGAATTGAC GGGGGCCCG ACAAGCAGCG GAGCATGTGG
901 CTTAATTcGA CGCAACGcGA AGAACCTTAC CAAGGCTGA CATAcACCGG AAACGGCCAG
961 AGATGGTcGC CCCCTGTGG TCGGTGTACA GGTGGTGCAT GGCTGTcGC AGCTGTGTC
1021 GTGAGATGTT GGGTTAAGTC CCGCAACGAG CGCAACCCt GTCCtGTGTT GCCAGCATGC
1081 CCTTGGGGT GATGGGGACT CACAGGAGAC TGCCGGGTC AACTCGGAGG AAGGTGGGGA
1141 CGACGTCAAG TCACTATGCC CCTTATGTCT TGGGCTGCAC ACgtGCTACA ATGGCCGTA
1201 CAATGAGCTG CGATAACCGCG AGGTGGAGCG AATCTAAAG AGCCGGTcTC AGTTCGGATT
1261 GGGGTCTGcA ACTCGACCCc ATGAAGTTGG AGTTGTAGT AATCGCAGAT CAGCATTGCT
1321 GCGGTGAATA CGTCCCCGG CTTGTACAC ACCGCCGTC ACgtCACGAA AGTCGGTAAC
1381 ACCCGAAGCC GGTGGCCCAA CCTTGTGGA GGGAGCCGTC GAAGGTGGGtA CTGGCGATTG
1441 GGACGAAGTC GTAACAAGGT AGCCGTACCG GAAGG

13. ORGANISM: Streptomyces albireticuli

1 CGGCgtGCTT AACACATGcA AGTcGAACG TGAAGCCtT CGGGGTGGAT TAGTGGCGAA
61 CGGGTGAAGTA ACACGTGGC AATCTGCCt GCACTCTGGG ACAAGCCtG GAAACGGGGT
121 CTAATACCGG ATAATACCTG CGAGGcATC TCGGTGGGTT GAAAGCTCCG GCGGTGcAGG
181 ATGAGCCCGC GGCCTATCAG CTTGTGGTg GGGTGTAGGC CTACCAAGGC GACGACGGGT
241 AGCCGGCCTG AGAGGGCGAC CGGCCACACT GGGACTGAGA CACGGCCAG ACTCCTACGG
301 GAGGcAGCAG TGGGAATAT TGCACAAATGG GCGAAAGCCT GATGcAGCGA CGCCGCGTGA
361 GGGATGACGG CCTTGGGGTtT GtAAACCTCT TtCAGCAGGG AAGAAGCGAA AGTgACGGTA
421 CCTGcAGAAG AAGCgCCGGC TAActACGT CCAGCAGCCG CGTAATAcG TAGGGCGCAA
481 GCGTTGTCCG GAATTATTGG GCGTAAAGAG CTCGTAGGcG GCTTGTGCG TCGGATGTGA

541 aagcccgggg cttAACCCG ggtctgcatt cgatacgggc aggcttagagt gtggtagggg
601 agatcggaat tcctgggtta gcggtaaat gcgcagatat caggaggaac accgggtggcg
661 aaggccgatc tctggccat tactgacgt gaggagcgaa agcgtgggg gCGAACAGGA
721 ttagataccc tggttagtcca cGCCGTAAC gttgggaact aggtgttggc gacattccac
781 gtcgtcggtg ccgcagctaa cgcattaagt tccccgcctg gggagtagcgg cgcAAGGGCT
841 aaaactaaa ggaattgacg gggggccgc caagcagcgg agcatgtggc ttaattcgc
901 gcaacgcgaa gaaccttacc aaggcttgac atataccgga aacggccaga gatggtcgac
961 cccttgttgtt cggtatacag gtgggtcatg gctgtcgtca gctcgtgtcg tgagatgtt
1021 ggttaagtcc cgcaacgagc gcaacccttg ttctgtgtt ccagcatgcc cttcgggggt
1081 atggggactc acaggagact gccgggggtca actcggagga aggtggggac gacgtcaagt
1141 catcatgccc cttatgtctt gggctgcaca cgtgctacaa tggccgggtac aatgagctgc
1201 gataccgtga ggtggagcga atctaaaaaa gccggctca gttcggattt gggctctgcaa
1261 ctgcacccca tgaagtttga gttgcttagta atcgcagatc agcattgtcg cggtaatac
1321 gttcccgggc cttgtacaca cccggccgtca cgtcacgaaa gtcggtaaca cccgaagccg
1381 gtggcccaac ctttgtggag ggagccgtcg aaggtagggac tggcgattttt ga

14. ORGANISM: Streptomyces netropsis

1 gacgaacgct ggcggcgtgc ttaacacatg caagtcgaac gatgaaggcct ttcgggggtgg
61 attagtggcg aacgggttag taacacgtgg gcaatctgcc cttcactctg ggacaagcc
121 tggaaacggg gtctataacc ggatacgcacc tgcctccgca tgggggtggg tggaaagctc
181 cggcgggtgaa ggatgagccc gcggcctatc agcttgggttgg tggggtaatg gcctaccaag
241 ggcacgcacgg gtagccggcc tgagagggcgc accggccaca ctgggactga gacacggccc
301 agactcctac gggaggcgcg agtggggaaattt attgcacaaat gggcggaaagc ctgtatgcgc
361 gacgcccgtg gagggtatgac ggccttcggg ttgttaaacct cttcagcagc ggaagaagcg
421 agagtgcacgg tacctgcaga agaagcgcgc gctaactacg tgccagcagc cgcggtaata
481 cgtagggcgc aagcgttgc cggaaattttt gggcgtaaag agctcgttagg cggcttgggt
541 cgtcgatgt gaaagcccg ggcttaacc cgggtctgca ttcgatacgg gcaggctaga
601 gtgtggtagg ggagatcgga attcctgggt tagcgggtaa atgcgcagat atcaggagga
661 acaccgggtt cgaaggcggc tctctggcc attactgcacg ctgaggagcga aaagcgtggg
721 gagcgaacag gattagatac cctggtagtc cacgcgtaa acgttggaa ctaggttttg
781 ggcacattcc acgtcgtcgg tgccgcagct aacgcattaa gttcccccgc tggggagtag
841 ggcgcgaagg ctaaaactca aaggaattga cggggggcccg cacaagcagc ggagcatgt
901 gcttaattcg acgcaacgcg aagaacctta ccaaggctt acatataccg gaaacggcca
961 gagatggtcg ccccttgcgt gtcgtatatac aggtgggtca tggctgtcg cagctcgat
1021 cgtgagatgt tgggttaagt cccgcacgac ggcacccct tttctgtgt tgccagcatg
1081 cccttcgggg tggatggggac tcacaggaga ctggccgggtt caactcggag gaaggtgggg
1141 acgacgtcaa gtcatcatgc cccttatgtc ttgggtcgca cacgtgtac aatggccgg
1201 acaatgagct ggcataccgt gagggtggagc gaatctaaa aagccggctc cagttcgat
1261 tggggctgc aactcgcaccc catgaagttt gatgtgttag taatgcgcaga tcagcatgt
1321 tgcggtaat acgttcccg gccttgcatac caccggccgt cacgtcacga aagtcggtaa
1381 caccgcgaagc cgggtggccca acccttgtgg agggagccgt cgaagggtggg actggcgatt
1441 gggacgaag

15. ORGANISM: Streptomyces subrutilus

1 agagtttgc cctggctcag gacgaacgct ggcggcgtgc ttaacacatg caagtcgaac
61 gatgaaggccc ttccgggtgg attagtggcg aacgggttag taacacgtgg gcaatctgcc
121 cttcactctg ggacaagccc tggaaacggg gtctataacc ggataaccact cctgtctgca
181 tgggcagggg ttgaaagctc cggcgggtgaa ggatgagccc gcggcctatc agcttgggt
241 tggggtaatg gcccaccaag ggcacgcacgg gtagccggcc tgagagggcgc accggccaca
301 ctgggactga gacacggccc agactcctac gggaggcgcg agtggggaaattt attgcacaaat
361 gggcggaaagc ctgtatgcgc gacgcgcgt gagggtatgac ggccttcggg ttgttaaacct
421 ctttcagcagc ggaagaagcg aaagtgcacgg tacctgcaga agaagcgcgc gctaactacg
481 tgccagcagc cgcggtaata cgtagggcgc aagcgttgc cggaaattttt gggcgtaaag

541 agctcgtagg cggcttgcgtca cgtcggatgt gaaagccccga ggcttaacccct cgggtctgc
601 ttgcatacgg gctagctaga gtgtggtagg ggagatcgga attcctggtg tagcggtgaa
661 atgcgcagat atcaggagga acaccgggtgg cgaaggcgga tctctggcc attactgacg
721 ctgaggagcg aaagcgtggg gagcgaacag gattagatac cctggtagtc cacgccgtaa
781 acgttggaa ctaggtgttgc gcgcacattcc acgtcgctgg tgccgcagct aacgcattaa
841 gttccccggcc tggggagtac ggccgcaagg ctaaaactca aaggaattga cggggggcccg
901 cacaaggcagc ggagcatgtg gcttaattcg acgcaacgcg aagaacctta ccaaggcttg
961 acatataccg gaaagcatta gagatagtgc cccccttgtg gtcggtatac aggtggtgc
1021 tggctgtcgt cagctcggt cgtgagatgt tgggttaagt cccgcaacga ggcgaacccct
1081 tgtcctgtgt tgccagcatg cttcggggt gatggggact cacaggagac cggccgggtc
1141 aactcggagg aaggtgggaa cgacgtcaag tcatcatgcc ccttatgtct tgggctgcac
1201 acgtgctaca atggccggta caatgagctg cgataccgtg agtggagcgc aatctcaaaa
1261 agccggcttc agttcggatt ggggtctgcgactcgacccccc atgaagtctgg agttgctagt
1321 aatgcagat cagcattgtc gcggtaata cgttccggg cttgtacac accggccgtc
1381 acgtcacgaa agtcggtaac acccgaagcc ggtggccaa cccgtaaggg agggagctgt
1441 cgaagggtgg actggcgatt gggacgaagt cgtaacaagg tagccgtacc ggaagggtgc
1501 gctggatcac ctcctt

16. ORGANISM: Streptomyces griseus subsp. griseus

1 caagtcgaac gatgaagcct ttcgggtgg attagtgccg aacgggtgag taacacgtgg
61 gcaatctgcc ctactctg ggacaagccc tggaaacggg gtctaatacc ggataacact
121 ctgtcccgca tgggacgggg taaaagctc cggcgggtgaa ggatgagccc gcggcctatc
181 agttgttgg tgggttaatg gcctaccaag gcgcacggg gtggccggcc tgagagggcg
241 accggccaca ctgggactga gacacggccc agactcctac gggaggcgc agtggggaaat
301 attgcacaat gggcggaaagc ctgatgcagc gacgcccgt gaggatgac ggccttcggg
361 ttgttaaacct ctgcggcggc ggaagaagcg agagtgcgg tacctgcaga agaagcggcg
421 gctaactacg tgccagcgc cgcggtaata cgtaggcgc aagcgttgc cggaaattatt
481 gggcgtaaaag agtcgttagg cggctgtca cgtcgatgt gaaagccgg ggcttaaccc
541 cgggtctgca ttgcatacgg gctagctaga atgtggtagg ggagatcgga attcctgg
601 tagcggtgaa atgcagat atcaggagga acaccgggtgg cgaaggcgga tctctggcc
661 attactgacg ctgaggagcg aaagcgtggg gagcgaacag gattagatac cctggtagtc
721 cacgcccgtaa acgttggaa ctaggtgttgc ggcacattcc acgtcgctgg tgccgcagct
781 aacgcattaa gttcccccggcc tggggagtac ggccgcaagg ctaaaactca aaggaattga
841 cggggggcccg cacaaggcgc ggagcatgtg gcttaattcg acgcaacgcg aagaacctta
901 ccaaggcttg acatataccg gaaagcatca gagatggtgc cccccttgtg gtcggtatac
961 aggtggtgca tggctgtcgt cagtcgtgt catgagatgt tgggttaagt cccgcaacga
1021 gcgcacccct tggctgtgt tgccagcatg cccttcgggg tggatggggac tcacaggaga
1081 ctgcgggggt caactcgag gaaggtgggg acgacgtcaa gtcatcatgc cccttatgtc
1141 ttgggctgca cacgtctac aatggccggt acaatagact gcgcgtccgc gaggcggagc
1201 gaatctcaaa aagccgtct cagttcgat tggggctgc aactcgaccc catgaagtgc
1261 gagttgctag taatcgaga tcagcattgc tgcggtaat acgttccgg gccttgata
1321 cacggccgt cacgtcacga aagtcggtaa cacccgaagc cggcggccca accccttg
1381 ggagggagct gtcgaagggtg ggactggcgaa ttgggacgaa gtcgtacaa ggtagccgta
1441 ccggaaagg

17. ORGANISM: Streptomyces cinereus

1 gtgcgttaaca catgcaggc gaacgatgaa cccgcttcgg tggggattt gtcggcgaacg
61 ggtgagtaac acgtggccaa tctgcctcc actccggac aagccctgga aacggggct
121 aataccggat atcacttcca ccctcctggg tgggggttga aagctccggc ggtggaggat
181 gagcccgccg cctatcgat gttggtagg gtaacggctc accaaggcga cgcacgggt
241 ccggcctgag agggcgaccg gccacactgg gactgagaca cggcccagac tcctacgg
301 ggcagcgtg gggatattt cacaatgggc gcaaggctga tgcagcgcacg ccgcgtgg
361 gatgacggcc ttcgggttgc aaacctttt cagcaggaa gaagcggaaag tgacggtaacc

421 tgcagaagaa gcgccggcta actacgtgcc agcagccgc gtaatacgta gggcgcaagc
481 gttgtccgga attattggc gtaaagagct cgtaggcggc ttgtcacgtc gggtgtgaaa
541 gcccggggct taacccccc tctgcattcg atacgggctg gctggagtgt ggtagggag
601 atcggaaattc ctgggttagc ggtgaaatgc gcagatatca ggaggaacac cggtggcga
661 ggcggatctc tggccatta ctgacgctga ggagcgaaag cgtggggagc gaacaggatt
721 agataaccctg gtatgtccacg ccgtaaacgg tggtactag gtgttggcga cattccacgt
781 cgtcgggtgcc gcagctaacg catatagttc cccgcctggg gagtacggcc gcaaggctaa
841 aactcaaagg aattgacggg ggcggcaca agcagcggag catgtggctt aattcgacgc
901 aacgcgaaga accttaccaa gccttgacat cgcgggaaa gcatcagaga tggtgcccc
961 cttgtggccg ggtgacaggt ggtgcatggc tgcgtcgc tgcgtcgtg agatgttggg
1021 ttaagtcccg caacgagcgc aacccttgc cctgttgcc agcaactctc ttggaggggg
1081 ttggggactc acggagacc gcccgggtca actcgagga agtggggac gacgtcaagt
1141 catcatgccc cttatgtctt gggctgcaca cgtgctacaa tggccggta aatgagctgc
1201 gataccgaa ggtggagcga atctcaaaaa gccggctca gttcggattt gggctcgaa
1261 ctcgacccca tgaagtcgga gttgcttagta atcgcagatc agcagtgtc cggtaatac
1321 gttcccgggc cttgtacaca ccgcccgtca cgtcacaagg gtcggtaaaca cccgaagccc
1381 gtggcccaac cagttgctg gggggagcgg tcgaagggtgg gactggcgat tggacgaag
1441 tcgtaacaag gt

18. ORGANISM: Streptomyces flaveus

1 gatcctggct caggacgaac gctggcgcc tgcttaaacat atgcaagtcg aacgatgaag
61 cccttcgggg tggatttagtgc gcaacgggt gagtaacacg tggcaatct gcccctcaact
121 tcgggacaag ccctggaaac ggggtctaat accggatagc actcccgccc tcctgggtgg
181 ggggtgaaag ctccggcggt ggaggatgag cccgcggcct atcagctgg tggtgaggt
241 acggctcacc aaggcgcga cgggtagccg gcctgagagg gcgaccggcc acactgggac
301 tgagacacgg cccagactcc tacgggaggc agcagtgccc aatattgcac aatgggcgc
361 agcctgatgc agcgcacggc cgtggggat gacggcttc ggttgtaaa cctctttcag
421 cagggaaagaa gcccttagggt gacggtaccc gcagaagaag cgcggctaa ctacgtgcca
481 gcagccgcgg taatacgtag ggcaagcg ttgtccggaa ttattggcg taaagagtc
541 gtaggcggct tgcacgtc ggtgtgaaag cccgggctt aacccgggt ctgcattcga
601 tacgggctgg ctggagtgt gtaggggaga tcggaattcc tgggttagcg gtgaaatcg
661 cagatatcag gagaaacacc ggtggcgaag gcggatctt gggcattac tgacgctgag
721 gagcggaaagc gtggggagcg aacaggatta gataccctgg tagtccacgc cgtaaacgg
781 gggacttagg tggggcgac attccacgtc gtcgggtcc cagctaacgc attaagtcc
841 ccgcctgggg agtacggccg caaggctaaa actcaaaggat attgacgggg gcccgcacaa
901 gcagccggc atgtggctt attcgacgc acgcgaagaa ctttaccaag gcttgacatc
961 gcccggaaag catcagagat ggtggccccc ttgtggccgg gtgacaggtg gtgcattgct
1021 gtcgtcagct cgtgtcgtga gatgttgggt taagtccgc aacgagcga acccttgc
1081 cgtgttgcga gcaacgggtt cggccgggtt gggactc acgcggacc ggggtcaact
1141 cggaggaagg tggggacgac gtcaagtcat catggccctt atgtttggg ctgcacacgt
1201 gctacaatgg ccgttacaat gagcggcgtat accgcaagggt ggagcgaatc taaaaagcc
1261 ggtctcagtt cggattgggg tctgcaccc gacccatga agtcggagtt gcttagtaatc
1321 gcagatcgc agtgcgtcgg tgaatacgtt cccgggctt gtacacaccg cccgtcact
1381 cacgaaagtc ggtAACACCC gaagcccgtg gcccAACCCCC ctgtggggaa gggagcggc
1441 gaaggtggga ctggcgattt ggacgaagtc gtaacaagggt agccgtaccg gaaggtgcgg
1501 c

19. ORGANISM: Streptomyces lavendulae

1 agtttgcattc tggctcagga cgancgtgg cggcgtnctt aanacatgtt ngtcgaacga
61 tgaagccctt cgggggtggat tagtggcga cgggtgagta acacgtggc aatctgc
121 tcactctggg acaagccctg gaaacggggct ctaataccgg ataccactcc tgcccgcatg
181 ggcgggggtt gaaagctccg cgggtgaaagg atgagccgc ggcctatcag cttgttgg
241 gggtaatggc ccaccaaggc gacgacgggt agccggcctg agagggcgc ac cggccacact

301 gggactgaga cacggcccag actcctacgg gaggcagcg tggggatat tgcacaatgg
361 gcgaaagcct gatgcagcga cgccgcgtga gggatgacgg cttcgggtt gtaaacctct
421 ttcaagcaggg aagaagcgaa agtgcacgta cctgcagaag aagcgccggc taactacgt
481 ccagcagccg cgtaataacg tagggcgcaa gcgttgtccg gaattattgg gcgtaaagag
541 ctgcgtaggcg gcttgtcacg tcggatgtga aagccccagg ctaacctcg ggtctgcatt
601 cgatacgggc tagcttaggt ntggtagggg agatcggaaat tcctgggtga gcggtaaat
661 gcgcagat caggaggaac accgggtggcg aaggcgatc tctggccat tactgacgct
721 gaggagcgaa agcgtgggg ggcgaacagga ttagataccc tggtagtcca cgccgtaaac
781 gttggaaact aggtgttggc gacattccac gtcgtcggtg ccgcagctaa cgcatthaagt
841 tccccgcctg gggagtaacgg ccgcaggct aaaactcana ggaattgacg gggggccgc
901 caagcggcgg agcatntggc ttaattcgc gcancngaa gaaccttacc aaggcttgac
961 atataccgga aagnattaga gatagtgcaccc cccttgcgtt cgnatacag gtggtgcatg
1021 gctgtcgtca gtcgtgtcg tgagatgtt ggttaagtcc cgcaacgn gn gcaaccctt
1081 tcctgttgc ccagcatgcc ctccgggtt atggggactc acaggagacc gccggggctca
1141 actcggagga aggtggggac gacgtcaagt catcatgccc cttatgtctt gggctgcaca
1201 cgtgctacaa tggccgtac aatgagctgc gataccgtga ggtggagcgn atctcaaaaa
1261 gccggtnca gttcggattt gggcttgca ctcgacccca tgaagtcgga gtcgttagta
1321 atcgcagatc agcattgctg cggtaatac gttcccccggc ctgtacaca ccgcggcgtca
1381 cgtcacgaaa gtcgtaaca cccgaagccg gtggcccaac ccgtaaaggag ggagctgtcg
1441 aagggtggac tggcattttt gacgaaatcg taacaaggtn gccgtaccgg aagggtgcggc
1501 tggatcacct cttt

20. ORGANISM: Streptomyces pseudoechinosporeus

1 gacgaacgct ggcggcgtgc ttaacacatg caagtcgaac gatgaagccc ttccgggtgg
61 attagtggcg aacgggtgag taacacgtgg gcaatctgcc ctccactctg ggacaagccc
121 tggaaacggg gtctaatacc ggatacgcacc tgccgaggca tctcggcggg tggaaagctc
181 cggcgggtgaa ggtgagccc gcggcctatc agcttgggg tggggtaatg gcctaccaag
241 ggcacgcacgg gtagccggcc tgagagggcg accggccaca ctgggactga gacacggccc
301 agactcctac gggagggcgc agtggggat attgcacaat gggcggaaagc ctgatgcacg
361 gacgcgcgt gaggatgac ggccttcggg ttgttaaacct cttcagcag ggaagaagcg
421 agagtgcacgg tacctgcaga agaagcgcgc gctaactacg tgccagcgc cgccgtata
481 cgtagggcgc aagcgttgac cggattattt gggcgtaaag agctcgttagg cggcttgg
541 cgtcgatgt gaaagcccg ggcttaaccc cgggtctgca ttgcatacgg gcaggctaga
601 gttcggtagg ggagatcggg attcctgggt tagcgggtgaa atgcgcagat atcaggagga
661 acaccgggtgg cgaaggcggg tctctgggcc gatactgacg ctgaggagcg aaagcgtgg
721 gagcgaacag gattagatac cctggtagtc cacgcgtaa acgttgggac taggtgtgg
781 cgacattcca cgtcgccgt gccgcagcta acgcattaag ttcccccgcct ggggagtagc
841 gccgcaggc taaaactcaa aggaattgac gggggccgc acaagcagcg gagcatgtgg
901 ctttaattcga cgcaacgcga agaaccttac caaggcttga catacaccgg aaacggccag
961 agatggtcgc ccccttgcgtt tcgggttaca ggtggcat ggctgtcgatc agctcgtgtc
1021 gtgagatgtt gggtaagtc cgcacacgag cgcaaccctt gtccctgtt gccagcatgc
1081 cttcgggggt gatggggact cacaggagac tgccgggtc aactcggagg aagggtgggaa
1141 cgacgtcaag tcatacatgcc ctttatgtct tgggctgcac acgtgttaca atggccggta
1201 caatgagctg cgataccgcg aggtggagcg aatctcaaaa agccggcttc agttcggatt
1261 ggggtctgca actcgacccc atgaagttgg agttgttagt aatcgacat cagcattgt
1321 gcggtgaata cgttcccccggc cttgttacac accgcggcgc acgtcacgaa agtcggtaac
1381 acccgaagcc ggtggccaa cccttgcgtt gggagccgcgtaa gaaagggggaa ctggcgattt
1441 ggacgaag

21. ORGANISM: *Sporichthya polymorpha*

1 tgatcctggc tcaggacgaa cgctggcggc gtgcttaaca catgcaagtc gancggtaa
61 ccacccctcggttggatca gtggcgaacg ggtgagtaac acgtggcaa cctggcccta
121 gctctggat aactccggaa aaccggagct aataccggat atgacaccga gcggcatcg
181 tcgggtgttgcgaa aagttttcg gcttagggatg ggcccgccgctatcagctt gttgggtgggg
241 taacggcccta ccaaggcgac gacgggttagc cggcctgaga gggcgaccgg ccacactggg
301 actgagacac ggcccagact cctacgggag gcagcgtgg ggaatattgc gcaatggcg
361 aaaggctgac gcagcgacgc cgcgtgggg acgaaggcct tcgggtcgta aacccctttc
421 agcagggacg aagcgaagt gacggtacct gcagaagaag caccggctaa ctacgtgcca
481 gcagccgcgg taatacgttag ggtcaagcg ttgtccggaa ttattggcg taaagagctc
541 gttaggcggct tgcacgtct gctgtgaaaa ctcggggctc aaccccgagc ctgcagtgga
601 tacgggcttag ctagagtgcg gtaggggaga ctggaattcc ttgtgttagcg gtgaaatgcg
661 cagatatcag gagaaacacc ggtggcgaag gcgggtctct ggccgatac tgacgcttag
721 gagcggaaagc gtggggagcg aacaggatta gataccctgg tagtccacgc cgtaaacgat
781 gggcgctagg tgcgtggatc ttccacgat ctccgtgccg cagctaacgc attaagcgcc
841 ccgcctgggg agtacggccg caaggctaa actcaaagga attgacgggg gccgcacaag
901 cggcggagca tgcgtggatc ttccacgat cgcgaagaac ctaccaagg ctgcacat
961 accgaaactg gcagagatgt caggccnca agggcggtat acaggtggtg catgggtgtc
1021 gtcagctcgt gtcgtggatc ttccacgat ctcggccgttgcgat gacggcaacc ctgcgttat
1081 gttgccagcg ctgcgtggatc ttccacgat cgcgaagaac ctaccaagg ctgcacat
1141 tggggatgtac gtcacatcat catgcccatttgcgtggatc ttccacgat ctcggccgttgcg
1201 ccggatcataaa gggctgcgttgcgat accgcaaggt ggacgttgcgat ctcggccgttgcg
1261 cggattgggg tctgcacgtc gacccatgtac gtcgtggatc ttccacgat ctcggccgttgcg
1321 aacgctgcgg tgaatacgtt cccggccctt gtcacacaccg cccgtcacgt caccggatc
1381 gtttacaccc gaaaccgggtg gcccnaaccctt tttggaggaa accgtcgaag gtggactgg
1441 cgatt

22. ORGANISM: *Sporichthya brevicatena*

1 gacgaacgct ggcggcgtgc ttacacatg caagtcgaac gtgaaccact tcgggtgggg
61 atcagtggcg aacgggtgag taacacgtgg gcaacctgccc cctagctctg ggataactcc
121 gggaaacccgg agctaataacc ggatgtgaca tcgagcggca tcgctcgatg tggaaagttt
181 ttccggctagg aatggggcccg cggcctatca gcttgggtgttggggtaacgg cctaccaagg
241 cgacgacggg tagccggcct gagagggcgaa cccggccacac tggactgag acacggccca
301 gactctacgg gaggcagcag tggggatat tgcgtggatc ttccacgat gacgcagcga
361 cggcgtgtca gggacgaaagg ctccgggtcg taaacccctt tcagcaggaa cgaaggcgaaa
421 gtgacgggtac ctgcagaaga agcaccggct aactacgtgc cagcagccgc ggtacatcg
481 agggtgcaag cggtgtccgg aattattggg cgtaaagacg tcgtggccggttgcgtacatcg
541 ctgcgtgtca aactcggggc tcaaccccgaa gctgcgtgt gatacgggttgcgtacatcg
601 cggtagggaa gactggaaattt cctgggtgttag cggtgaaatg cgacatgttgcgtacatcg
661 cggcgtggcgaa aggccgggtct ctggaccgttgcgtacatcg gacgttgcgtacatcg
721 cgaacaggat tagataccctt ggtgtccac gccgtaaacg ttggcgtgtca ggtgtggggat
781 ctccacgat tctccgtgcc gcastaacgc attaagcgcc cccgtgggg agtacggccg
841 caaggctaaa actcaaagga attgacgggg gcccgcacaa gcccggggcgttgcgtacatcg
901 attcgacgca acgcaagaa cttaccaag gcttgcacata tagggaaaac tggcagagat
961 gncagggtccg caaggccctt atacagggtgg tgcgtggatc ttccacgat ctcggccgttgcg
1021 atgtgggtt aagtcccgca acgacgttgcgtacatcg gacgttgcgtacatcg
1081 cggggactca taggagactg cccgggtcaatggatc ggtggggatc acgttgcgtacatcg
1141 atcatgcccc ttatgtcttgcgtgttgcgtacatcg gacgttgcgtacatcg
1201 ataccgcaag gtggagcgaa tcccaaaaag cccgttgcgtacatcg ggtgtggggatc
1261 tcgaccccat gaagtcggag tcgcttagta tcgcaatcg gacgttgcgtacatcg
1321 ttcccgccgttgcgtacatcg gtcacgaaag tcggtacaccc cccgttgcgtacatcg
1381 tggcccaacc cttgtggagg gaggccgttgcgtacatcg