Biological Treatment of Tannery Wastewater by Using Salt Tolerant Bacteria

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Outline

Introduction to tannery waste water

Waste water problem in Mongolia

Materials and methods

Results and discussion
Introduction to tannery waste water

Biochemical Oxygen Demand (BOD)

Chemical Oxygen Demand (COD)

Total Dissolved Solids (TDS)

Suspended Solids (SS)

Chromium and sulphides
pH 5-10
Waste water problem in Mongolia

All of tannery industries are located near the Tuul River, which mainly contributes to the pollution status of the river. In Mongolia, all of the tanneries don’t have their own treatment plant. The Khargia Company is the only one private company to treat wastewater from tanneries.
Significantly

Treatment is necessary due to the wide range of toxic chemicals in untreated tannery and their effects on the environment.

My propose

- Isolation indigenous bacterial strain having detoxification activity
- Lab scale degradation hexavalent chromium into its trivalent form.
Materials and methods

- Isolation of bacteria and optimum growth condition

Content of LB medium

- Tryptone 10g/L
- Yeast extract 5g/L
- Sodium chloride 5g/L
- D-Glucose 1g/L

pH 7.2

K₂Cr₂O₇
Materials and methods

- Phylogenetic analysis of bacteria and identification

16S rRNA sequence data

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Description</th>
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</table>
| HT1      | ATTGAACGCTGGCGGCAGGCCTAACACATGCAAGTGGCAGCAGG | ATACCTTGAGGGATAGCCCGGAACCCGGATTAATACCCGATACGCCCTGAGGGGGAAGCCGGGCTCCGGCTCGCGCTATTGGATGGGCCCATGTCGGATTAGTTA-GTTGGGTGGGGTAATGGGCTTACCAAGGCAGCTGAGATCGTAGCTG | Constructing phylogenetic tree & identification of bacterial strains using software

- Clustal W1.83 XP
- NJPlot.exe

BLAST search

- [http://www.ddbj.nig.ac.jp](http://www.ddbj.nig.ac.jp)
- [http://www.eztaxon.org](http://www.eztaxon.org)
Isolation of bacteria and optimum growth condition

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>HT1</th>
<th>HT2</th>
<th>HT3</th>
<th>HT4</th>
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<tbody>
<tr>
<td><strong>Strain numbers</strong></td>
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<td><strong>Morphological characteristic</strong></td>
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<td>Colony morphology</td>
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<td>Colony size</td>
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<td><strong>Physiological characteristic</strong></td>
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<td>pH range</td>
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<td>4-9</td>
<td>4-10</td>
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<td>NaCl range (% w/v)</td>
<td>5-9.5</td>
<td>5-7</td>
<td>5-9.5</td>
<td>5-9.5</td>
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<tr>
<td>Temperature range (T⁰)</td>
<td>4-45</td>
<td>15-45</td>
<td>4-45</td>
<td>15-45</td>
</tr>
</tbody>
</table>
Phylogenetic analysis of isolates

Enterobacter cancerogenus ATCC 33241 (Z96078)
- HT1

Enterobacter asburiae JCM 6051 (AB004744)

Enterobacter hormaechei CIP 10344 (AJ508302)

Enterobacter gergoviae JCM 1234 (AB004748)

Enterobacter mori R18-2 (EU721605)

Enterobacter ludwigii EN-119 (AJ853891)
- HT3

Enterobacter kobei CIP 105566 (AJ508301)

Enterobacter nimipressuralis LMG 10245 (Z96077)

Enterobacter soli LMG 25861 (GU814270)

Enterobacter amnigenus ATCC 33072 (AB004749)

Enterobacter intermedius JCM 1238 (AF310217)

Enterobacter aerogenes ATCC 13048 (AB004750)

Enterobacter helveticus LMG 23733 (DQ273688)

Enterobacter pulveris LMG 24057 (DQ273684)

Cronobacter sakazakii DSM 4485 (EF059843)

Enterobacter sacchari LMG 26783 (JQ001784)

Enterobacter oryzae LMG 24251 (EF488759)

Enterobacter radicicola DSM 16656 (AY563134)

Enterobacter arachidis KCTC 22375 (EU672801)

Enterobacter cowanii JCM 10956 (AJ508303)

Enterobacter cloacae JCM 6049 (Z96079)

Enterobacter dissalvens ATCC 23373 (Z96079)

Pantoea agglomerans ATCC (AJ233423)

Bremeria alni ICMP 1281 (AJ233409)

S. liquefaciens CIP 103238 (AJ306725)

S. grimesii DSM 30063 (AJ233430)

S. proteamaculans DSM4543 (AJ233434)

S. plymuthica DSM 4540 (AJ233433)

S. quinivorans DSM 4540T (AJ233433)

S. fonticola DSM 4576T (AJ233429)

S. glossinae C1T (FJ790328)

S. ficaria DSM 4569T (AJ233428)

S. entomophila ATCC43705 (AJ233427)

S. odorifera DSM 4582T (ADBY010)

S. nematodiphila DZ0503SBS1 (EU036987)

S. marcescens (AB061685)

S. rubidaea JCM1240 (AB0047)

Enterobacter aerogenes (AB00475)
Cr (VI) reduction by HT1

- Percentage of Cr(VI) 15mg/L reducing
- Percentage of Cr(VI) 30mg/L reducing

Growth (OD 600nm)

- Without Cr(VI)
- With Cr(VI) 15mg/L
- With Cr(VI) 30mg/L
Chromium resistant bacteria have been isolated from tannery effluents, Mongolia.

All of strains are salt tolerant and two strain belonged to the genus *Enterobacter* and two strains belonged to the genus *Serratia*.

The results indicate that indigenous bacterial strains are able to reduce hexavalent chromium and these bacterial strains can be exploited for lab-scale degradation of the tannery waste waters.
Thank you