PRODUCTION OF BIOETHANOL BY ZYMOMONAS MOBILIS FROM COFFEE PULP WASTE

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OBJECTIVES:
1. Collection of Zymomonas mobilis
2. Pretreatment of coffee pulp waste
3. Production and purification of ethanol
4. Study of fermentation parameters

METHODOLOGY
1. Collection of Zymomonas mobilis
   The standard strain of Zymomonas mobilis 2428 from National collection of Industrial Microorganism(NCIM), Pune.
2. Pretreatment of coffee pulp waste.
   Coffee pulp was collected from chikamagaluru dist and hydrolysed with dilute sulfuric acid (H2SO4). In order to break down the cellulose and hemicellulose into simple sugar the ground coffee husk sample was maintained at solid to liquid ratio of 1:10, in 250 ml round bottom flask.
3. Production and Purification of ethanol
   Processing of fermentation: The submerged fermentation was carried out the coffee pulp extracted were used as a fermentation medium for the biosynthesis of ethanol. The coffee pulp waste is filtered. Sugar level was checked by using Brix meter. The filtrate was inoculated with 5% Zymomonas mobilis. The filtrate is mixed well and kept for fermentation. Incubate for 3 to 5 days at 28±2°C temperature.
   Distillation process: The sample is filtered and liquid is collected. The Distillation unit is arranged and the liquid is distilled. Alcohol is produced using distillation unit. Alcohol is recovered and collected.
4. Study of fermentation parameter
   The fermentation kinetics for the biosynthesis of ethanol is temperature and inoculum size optimize for the maximum yield.

RESULT AND CONCLUSION:

<table>
<thead>
<tr>
<th>Fermentation period in days</th>
<th>Alcohol produced</th>
<th>According to AOAC chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>day 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>day 2</td>
<td>0.9970</td>
<td>2%</td>
</tr>
<tr>
<td>day 3</td>
<td>0.9913</td>
<td>6%</td>
</tr>
<tr>
<td>day 4</td>
<td>0.9847</td>
<td>11.05%</td>
</tr>
<tr>
<td>day 5</td>
<td>0.9872</td>
<td>9.12%</td>
</tr>
</tbody>
</table>

From the above result it can be concluded that the coffee pulp waste is used for the production of bioethanol efficiently by Z. mobilis. The percentage of ethanol produced is high in 72 hours of fermentation period.

The low cost of coffee pulp and its high content of water soluble sugars, it is the first among horticulture crops used as feed stock for the production of industrial alcohol by submerged fermentation. Most of the existing petrol engines operate on blends of up to 15% bioethanol with petroleum. From this study we can conclude that the coffee pulp waste is having the efficiency of producing ethanol with the help of Z. mobilis.
Photographs:

- fig.(1) Zymomonas mobilis 2428
- fig.(2) Microscopic view of Z. mobilis
- fig.(3) Coffee husk
- fig.(4) Coffee powder
- fig.(5) Coffee filtrate
- fig.(6) Fermentation process