

## Isolation and Selection of Strains Perspective for Sewage Sludge Processing

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**Abstract :** One of the methods of organic waste bioconversion into environmentally-friendly fertilizer is composting. Microorganisms that produce hydrolytic enzymes play a significant role in accelerating the process of organic waste composting. We studied the enzymatic potential (amylase, protease, cellulase, lipase, urease activity) of bacteria isolated from the sewage sludge of Nur-Sultan, Rudny, and Fort-Shevchenko cities, the dacha soil of Nur-Sultan city, and freshly cut grass from the dacha for processing organic waste and identifying active strains. Microorganism isolation was carried out by the cultures enrichment method on liquid nutrient media, followed by inoculating on different solid media to isolate individual colonies. As a result, sixty-one microorganisms were isolated, three of which were thermophiles (DS1, DS2, and DS3). The highest number of isolates, twenty-one and eighteen, were isolated from sewage sludge of Nur-Sultan and Rudny cities, respectively. Ten isolates were isolated from the wastewater of the sewage treatment plant in Fort-Shevchenko. From the dacha soil of Nur-Sultan city and freshly cut grass - 9 and 5 isolates were revealed, respectively. The lipolytic, proteolytic, amylolytic, cellulolytic, ureolytic, and oil-oxidizing activities of isolates were studied. According to the results of experiments, starch hydrolysis (amylolytic activity) was found in 2 isolates - CB2/2, and CB2/1. Three isolates - CB2, CB2/1, and CB1/1 were selected for the highest ability to break down casein. Among isolated 61 bacterial cultures, three isolates could break down fats - CB3, CBG1/1, and IL3. Seven strains had cellulolytic activity - DS1, DS2, IL3, IL5, P2, P5, and P3. Six isolates rapidly decomposed urea. Isolate P1 could break down casein and cellulose. Isolate DS3 was a thermophile and had cellulolytic activity. Thus, based on the conducted studies, 15 isolates were selected as a potential for sewage sludge composting - CB2, CB3, CB1/1, CB2/2, CBG1/1, CB2/1, DS1, DS2, DS3, IL3, IL5, P1, P2, P5, P3. Selected strains were identified on a mass spectrometer (Maldi-TOF). The isolate - CB 3 was referred to the genus *Rhodococcus rhodochrous*; two isolates CB2 and CB1 / 1 - to *Bacillus cereus*, CB 2/2 - to *Cryseobacterium arachidis*, CBG 1/1 - to *Pseudoxanthomonas* sp., CB2/1 - to *Bacillus megaterium*, DS1 - to *Pediococcus acidilactici*, DS2 - to *Paenibacillus residui*, DS3 - to *Brevibacillus invocatus*, three strains IL3, P5, P3 - to *Enterobacter cloacae*, two strains IL5, P2 - to *Ochrobactrum intermedium*, and P1 - *Bacillus licheniformis*. Hence, 60 isolates were isolated from the wastewater of the cities of Nur-Sultan, Rudny, Fort-Shevchenko, the dacha soil of Nur-Sultan city, and freshly cut grass from the dacha. Based on the highest enzymatic activity, 15 active isolates were selected and identified. These strains may become the candidates for bio preparation for sewage sludge processing.

**Keywords :** sewage sludge, composting, bacteria, enzymatic activity

**Conference Title :** ICEIAM 2022 : International Conference on Environmental, Industrial and Applied Microbiology

**Conference Location :** Istanbul, Türkiye

**Conference Dates :** August 16-17, 2022