DATA SHEET: SELECTED CHARACTERISTICS OF BACTERIAL SPECIES

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RoeTech 106PS: Bacterial Cultures for Wastewater Treatment

RoeTech 106PS is a highly concentrated culture which consists of both vegetative bacterial cells and our patented **RoeTech** bacterial spores. This versatile formulation incorporates all the benefits of a spore bearing product (heat resistance, chemical resistance, longer shelf life, etc.) while still allowing for the more immediate waste degrading action of the vegetative cells. Applications for this product are varied and include: municipal wastewater treatment, food processing, livestock and manure ponds, aerated septic tanks, and others.

All of the *Bacillus* strains found in **RoeTech 106PS** are naturally occurring isolates which are able to produce multiple enzyme systems and are capable of adapting to wastewater environments quickly. The *Pseudomonas* strains have unique capabilities to degrade many types of organic molecules. These would include surfactants and alcohols, as well as other chemicals commonly found in industrial wastewaters including hydrocarbon and phenolic containing compounds.

RoeTech 106PS, with its multiple bacterial strains, will produce a vast array of enzymes which will perform over broad and variable ranges in temperature, pH, DO, and other environmental conditions.

Selected Species Characteristics:

Bacillus amyloliquefaciens (2) Strains

Bacillus amyloliquefaciens was thought to have been a variety of *B. subtilis*, but has been differentiated by DNA analysis. This species tends to produce ample amylase or starch degrading enzymes. The name amyloliquefaciens means "starch digesting." [1]

Selected Characteristics	Aerobic / Facultative Gram Positive Oxidase Neg / Pos pH Range: 6-10 Temp Range (°C) 10 to 30+ Spores Produced
Enzymes Produced	Amylase Lipase Nitrate Reductase Protease Urease

Bacillus macerans

Bacillus macerans' spores are not common in in soil and therefore, are not wide spread in the environment. Most strains will decompose plant materials such as pectin and other plant polysaccharides. Additionally, many strains of *B. macerans* have the genetic capability to fix Nitrogen under certain conditions. [1]

Selected Characteristics	Aerobic / Facultative Gram Positive Oxidase Positive pH Range: 6-10 Temp Range (°C) 10 to 30+ Spores Produced
Enzymes Produced	Cellulase Lipase Nitrate Reductase Protease Urease

Bacillus pumilus

Bacillus pumilus spores are widespread in soil and actually are more common than those of *Bacillus subtilis*. Typically, *Bacillus pumilus* will have a requirement for growth factors such as biotin. Most strains will grow in nutrient media with up to 7% NaCl added. [1]

Selected Characteristics	Aerobic / Facultative Gram Positive Oxidase Positive pH Range: 6-10 Temp Range (°C) 10 to 50+ Spores Produced
Enzymes Produced	Lipase Protease

Bacillus subtilis (2) Strains

Bacillus subtilis, historically described as the "hay bacillus," can be easily isolated from soaked hay. It's spores are also commonly found in soil. *Bacillus subtilis* bacteria take part in the early breakdown of many plant and animal materials. Pectin and other plant polysaccharides are degraded. [1]

Selected Characteristics	Aerobic / Facultative Gram Positive Oxidase Positive pH Range: 6-10 Temp Range (°C) 10 to 50+ Spores Produced
Enzymes Produced	Amylase Cellulase Lipase Nitrate Reductase Protease Urease

Pseudomonas putida

Pseudomonas putida is a non pathogenic organism commonly found in soil where they are important in aiding the nutrient cycles of Carbon and Nitrogen. These organisms have great genetic diversity and are capable of breaking down many substances that others cannot. *Pseudomonas putida* does not require growth factors. Some strains will produce nitrite from nitrate. [1]

Selected Characteristics	Aerobic Gram Negative pH Range: 6-10 Temp Range (°C) 5 to 30+ Vegitative Cell
Enzymes Produced	Lipase Multiple Enzymes

Pseudomonas fluorescens

Pseudomonas fluorescens is a non pathogenic organism commonly found in soil where they are important in aiding the nutrient cycles of Carbon and Nitrogen. These organisms have great genetic diversity and are capable of breaking down many substances that others cannot. Pseudomonas fluorescens does not require growth factors and most strains can grow near 5 degrees Celsius [1]

Selected Characteristics	Aerobic Gram Negative pH Range: 6-10 Temp Range (°C) 5 to 30+ Vegitative Cell
Enzymes Produced	Lipase Multiple Enzymes

Notes:

[1] Information taken and adapted from the Bergey's Manual of Determinative Bacteriology 8th edition and from the Bergey's Manual of Systematic Bacteriology Volume 2