Special Report (sample)

Sustainability Enablers – Fermentation-based Chemicals

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INTRODUCTION

About this report:

- ✓ Increasing demand for sustainable feedstock materials has driven the chemical industry to look for alternative sustainable production technologies. In this regard, fermentation-based routes have paved way for producing several low-carbon chemicals that form the basis of multiple downstream value chains.
- ✓ This report aims at providing a comprehensive overview of current state of technology development and the leading players active in fermentation-based chemical production technologies. The report covers **20 base chemicals** (mainly acids and alcohols) that are either converted to other derivatives or polymerized to produce bio-based polymers.
- ✓ For each base chemical, known fermentation technologies, their readiness level, installed or upcoming capacities, penetration in the key applications, active players and collaborations have been captured, among other details.

Relevant audience:

- ✓ Producers and consumers of the base chemicals (or their derivatives) covered in this report
- ✓ Venture capitalists (VCs), institutional and individual investors
- ✓ Companies interested in sustainable raw materials or polymers

Customization:

- ✓ Report contents can be customized based on user requirements, e.g., chemicals of interest can be selected. Accordingly, report coverage shall be reduced or expanded to the specific areas of interest.

Chemical Production via Fermentation

Base chemicals covered in the report			
1	Glycerol	11	Adipic acid
2	Propanediol	12	Glutamic acid
3	Sorbitol	13	Muconic acid
4	Lactic acid	14	Maleic acid
5	Butanediol/ Isobutanediol	15	Methacrylic acid
6	Furfural	16	Dodecanedioic acid (DDDA)
7	1,5-Pentanediamine	17	Citric acid
8	Succinic acid	18	Sebacic acid
9	Itaconic acid	19	Azelaic acid
10	Propionic acid	20	Butyric acid/ Isobutyric acid

REPORT OVERVIEW

20 base chemicals behind 50+ value chains

Sustainable chemical feedstock for the low-carbon downstream products

Holistic assessment in terms of IP, technology, commercialization and value chain participation

Technology developers and manufacturers range from start-ups to potential disruptors

Information covered on each base chemical

Product

- ✓ Scope of fermentation technology (direct fermentation or via fermentation-based feedstock)
- ✓ By-products, value-addition opportunities

Technology

- ✓ Technology readiness level (TRL)
- ✓ Microorganisms, process conditions, conversion process and output
- ✓ Patents and research collaborations

Commercialization

- ✓ Applications and markets
- ✓ Capacities (existing and planned) and locations
- ✓ Business partnerships, investments, grants, M&A

RESEARCH METHODOLOGY

Methodology

- A comprehensive search was performed on various platforms to map the relevant information on each chemical. For this, focused secondary research was conducted. In order to fill the gaps existing after this, primary research was conducted wherever necessary.
- Though some of the chemicals may not be directly synthesized via fermentation, these have been considered as one or more of their raw materials are produced based on fermentation process.
- In case of non-commercialized technologies, relevant research and IP information has been covered. Major companies, start-up and universities have been highlighted.
- Key players have been profiled, outlining their technologies, commercial activities, financials and IP.

Information Sources

Following paid and public sources of information were referred (not exhaustive):

- Company websites, product brochures and news/media sections
- Specific publications/magazines on fermentation technologies
- Other commercial databases such as Factiva, Crunchbase, Pitchbook, Bloomberg and EMIS to capture/validate company-specific information
- Patents on databases such as Questel Orbit
- Scientific literature published on databases such as ScienceDirect, ResearchGate, Scopus, SpringerLink and Wiley Online
- Aranca internal knowledgebases and industry experts

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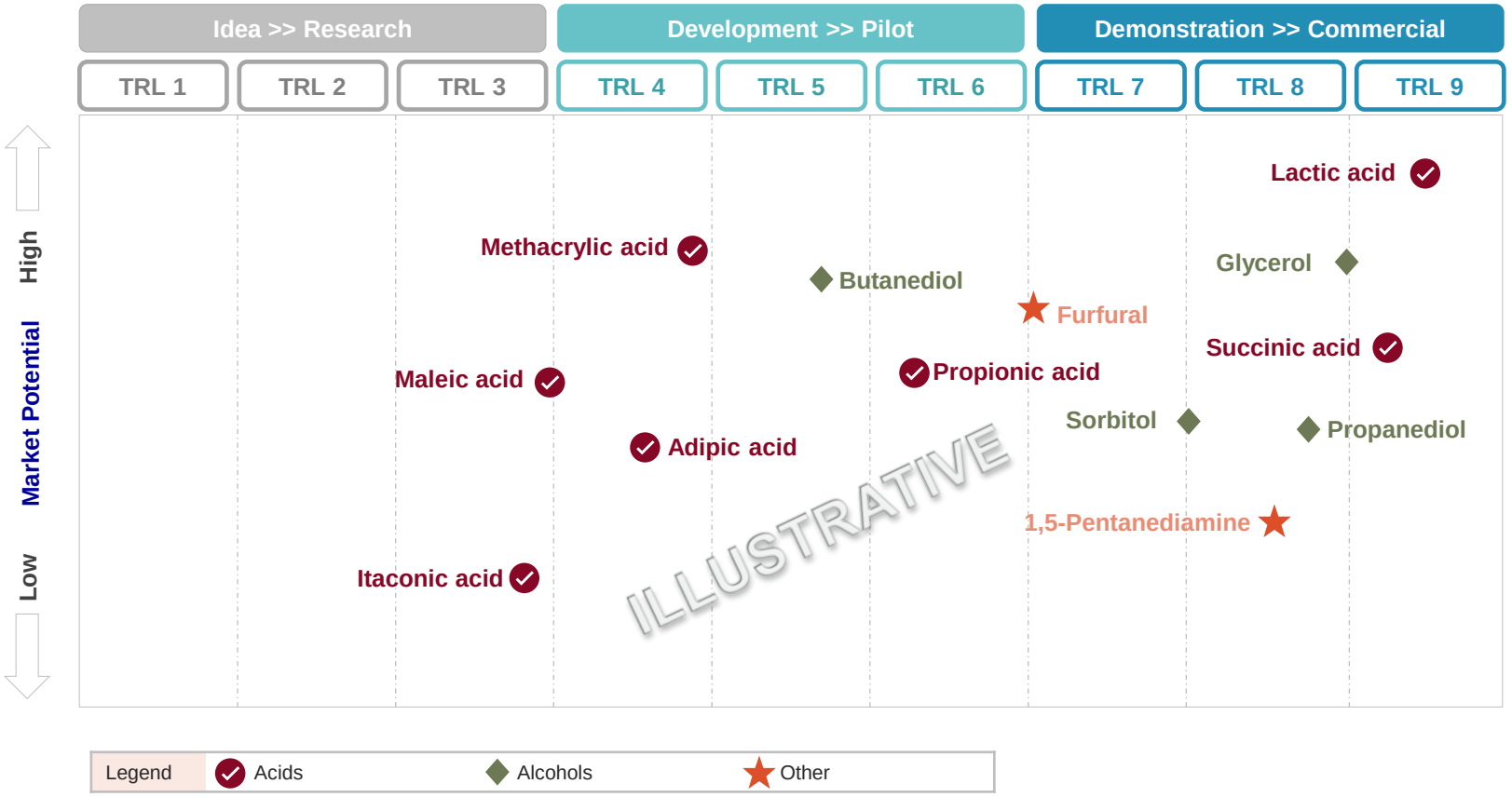
Chemical Production via Fermentation

Technology Readiness Level



Note: Above representation is for the sample illustration purpose only and may not reflect the right scenario for some of the chemicals.

Chemical Production via Fermentation

Competitor Assessment

Lactic acid

Company	Technology Potential	Ecosystem Presence	Financials	Overall
NatureWorks				
TotalEnergies Corbion				
futerro				
MITSUBISHI CHEMICAL				
XXX				
XXX				
XXX				
XXX				
XXX				

Indicators

- Very High
- High
- Medium
- Low
- Very Low

Chemical Production via Fermentation

Production Capacities

Succinic acid

Entity	Type	Total Installed capacity (KTA)	Plant Location(s)	Status
Succinity (DE)	Joint venture	10,000	Montmeló, Spain	Operational
GC Innovation America (Myriant) (US)	Standalone	xxx	Lake Providence, USA	xxx
BioAmber (CA)	Standalone	xxx	Sarnia, Canada	xxx
Reverdia (IT)	Joint venture	xxx	Cassano Spinola, Italy	xxx
Xxx	xxx	xxx	xxx	xxx
Xxx	xxx	xxx	xxx	xxx
Total	xxx	xxx	xxx	

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Chemical Production via Fermentation

Key Patents

Methacrylic acid

Publication Number	Assignee	Title	Publication date	Research focus	Benefits
US11248243B2	MITSUBISHI CHEMICAL UK LIMITED	Process for the biological production of methacrylic acid and derivatives thereof	2022-02-15	Production	• Sustainable low-carbon methacrylic acid production
US20170073665A1	GENOMATICA INC	MICROORGANISMS FOR THE PRODUCTION OF METHACRYLIC ACID	2017-07-21	Non-naturally occurring microorganism	• High-yield production of methacrylic acid with low-carbon process
Xxx	Xxx	Xxx	Xxx	Xxx	Xxx

Chemical Production via Fermentation

Player Profile

Propionic acid

Website: Link **Est.:** 2012 **HQ:** FR **Total Funding**: €70 million

About Afyren

The company has come up with an environment-friendly technology AFYNERIE, which uses natural microorganisms for producing a wide range of "biosourced replacements" for various industries. In 2019, Afyren has received funding of over €70 million enabling the company to grow its production scale from a pilot stage to an industrial scale. With the use of AFYNERIE technology, the company produces a "family of 7 completely biosourced organic acids" including natural acetic acid, propionic acid, butyric acid, isobutyric acid, valeric acid, isovaleric acid, and caproic acid.

The products produced by Afyren are of high quality through using the process of **fermentation** and achieve over "99% purity for certain applications." The company produces a wide range of organic acids enabling it to enter the global market. Its natural molecules are identical to those that usually industries use and are made from petroleum.

Chemical Production via Fermentation

List of Companies Covered

Note: Above representation is for the sample illustration purpose only and is not exhaustive.

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