

SUSTAINABILITY IN BIOPROCESSING: A CASE STUDY OF BIOPROCESS- SUPERCRITICAL FLUID EXTRACTION OF VANILLIN

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**“Sustainability Case Studies Competition”
Green and Sustainable Chemistry Award**



TERMS

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Supercritical fluids:

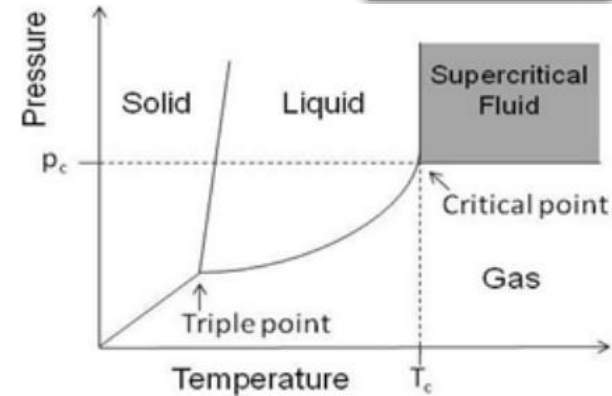
- It is any substance at a temperature and pressure higher than its critical value.

Bioprocess:

- It is an eco-efficient process that makes use of renewable resources.

Sustainability Development Goals (SDGs):

- Also known as Transforming our world: the 2030 Agenda for Sustainable Development is a set of 17 "Global Goals" with 169 targets between them.



INTRODUCTION

Vanillin (4-hydroxy-3-methoxybenzaldehyde) is a widely used flavor in the food industry and it is the main component of vanilla.

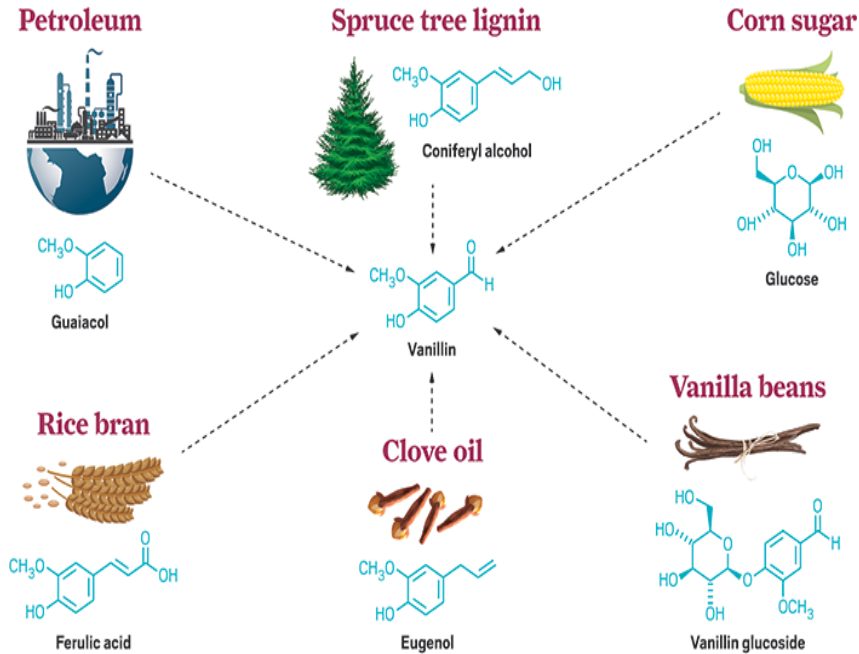


ROOT OF THE PROBLEM

- Natural vanillin is obtained from *Vanilla planifolia* but not sufficient to meet the consumer demand.
- The increase demand for “ natural” and healthy flavour.



ROUTE OF VANILLIN BIOCONVERSION

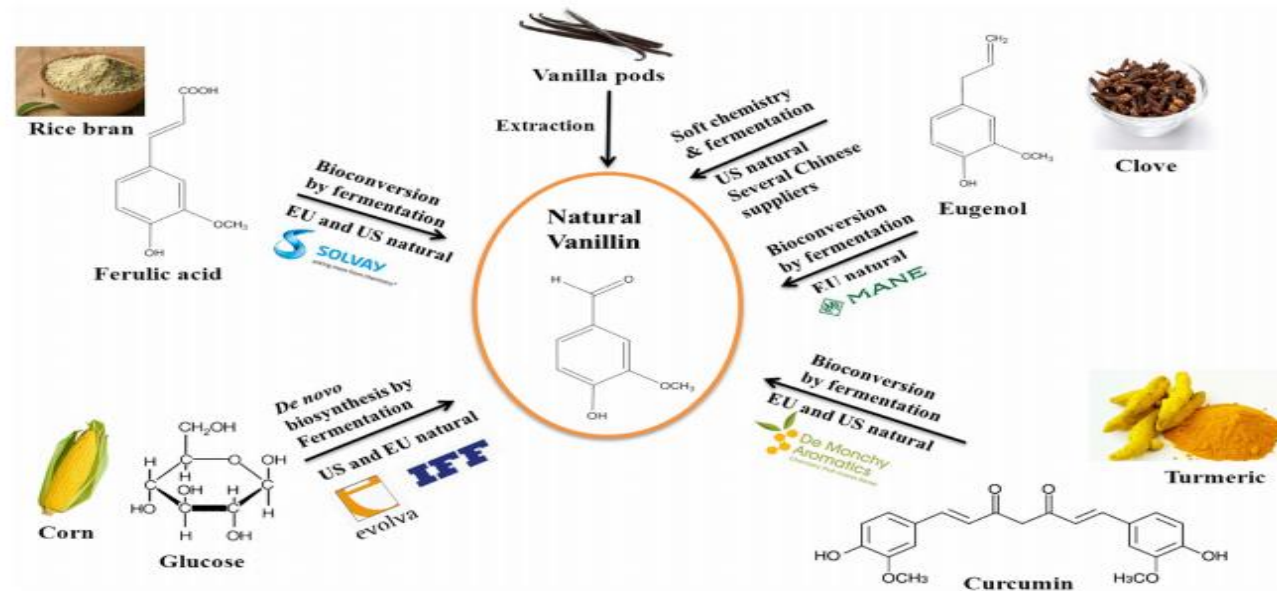


Source : Melody, 2016

The wide gap between the **prices of natural** and **synthetic vanillin** couple with limitation of meeting the **market demand through vanilla pod** have necessitated its bioconversion.

SUSTAINABLE PRODUCTION ROUTE

- Natural vanillin products have been shown by chemical industry proving the sustainable process development.



Source: Gallage and Moller, 2015.

CHALLENGES IN PRODUCTION

- The previous recovery techniques like solvent extraction, microwave extraction, distillation pose a problem (Shams et al., 2015).
- Large amount of solvent is used in most extraction.
- Toxic solvents leaves traces of residue.
- It presents safety concern and environmental risk.
- Low yield and recovery in previous methods of separation.

ON-GOING RESEARCH

- Provide environmental friendly routes and use glucose as renewable feed stocks for vanillin production.
- Supercritical CO₂ which is an environmental friendly solvent will be used as an alternative separation technique.
- The techno-economics feasibility of the process development is under investigation. The basic reason for this is to develop the economic feasibility of industrial scale production of vanillin.

ON-GOING RESEARCH



A: Shake flask



D –Fermentation broth



B: Bioreactor

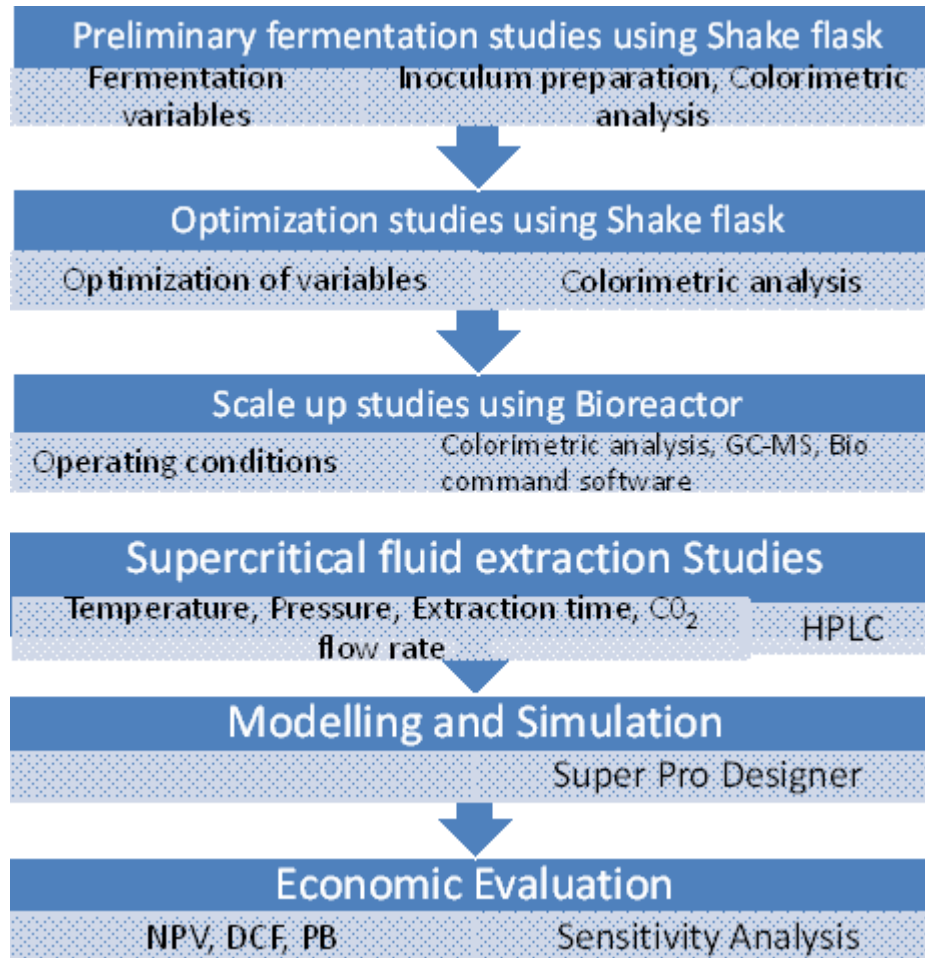


E-Vanillin Test



C: SFE Pilot plant

FLOW CHART OF RESEARCH



Case Study Address SDG Goals



Goal 3: The good health and well-being of the consumer.



Goal 9: The economic feasibility of sustainable industrialization of vanillin production.



Goal 12: The sustainable consumption and production pattern of vanillin.

CONCLUSION

- This case study presented the production of vanillin from glucose and use green chemistry principle for its recovery.
- It address the sustainable consumption and production pattern of vanillin.
- My PhD research also look into other bioproducts sustainable process development.

ACKNOWLEDGMENT



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August, 22-24, 2017.

