ISCC
INDIAN SOCIETY OF COSMETIC CHEMISTS

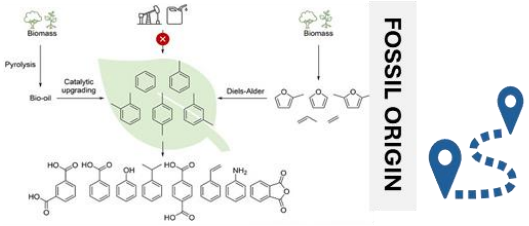
JAIPUR, 19-21 FEB

# Accessing Bio-Aromatic Systems: Advancing Sustainability Through Circular Biomass Valorization Using an Atom-Efficient Chemical Approach

*D. G. S. Sudhakar[1], Shubhrajit NAG[2], Steve Thomas Pannakal [1], Sherluck JOHN[1], Umesh AWARE[2]*
*[1] L'Oréal Research and Innovation, Bangalore, India, [2]L'Oréal, Research and Innovation Mumbai, India*

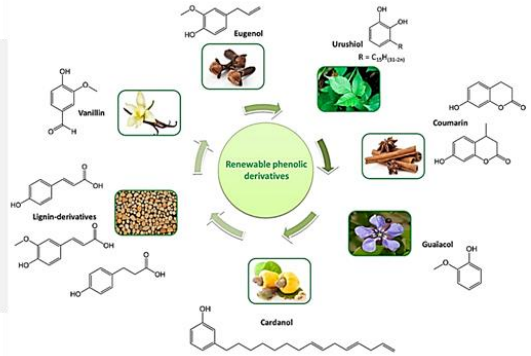
## INTRODUCTION

**AROMATIC SYSTEMS** play key roles in cosmetic and beauty ingredients for fragrance, preservation, antioxidants, and UV protection, These compounds provide scent, stability, and skin benefits.. Over the years, to ensure a consistent and reliable supply, **aromatic compounds** have frequently been derived **from fossil-based materials**. However, utilizing **renewable resources** marks a significant move towards more sustainable production.




FOSSIL ORIGIN

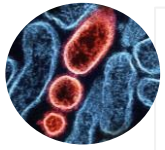
RENEWABLE ORIGIN



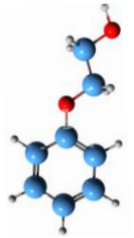

**1299** Cosmetic Products[3]
**28** Phenolic Compounds
**13.2%** Anti Aging
**5.2%** Sunscreens
**4.8%** After Sun

**THE CURRENT INVENTION** provides a solution to access **Phenoxyethanol** and **Sodium Benzoate & Salicylic acid**. The key starting material is **Cardanol** which is derived from the **bio-based feed stock** i.e., Cashew Nutshell Liquid (CNSL) which is a non-edible feedstock.

L'ORÉAL
RESEARCH
& INNOVATION
SAPMENA

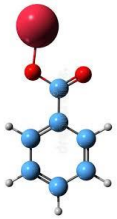


*Since most of cosmetic formulations contains **water and organic ingredients,** they provide an ideal environment for microorganisms to thrive hence Preservatives are essential components to be in place*



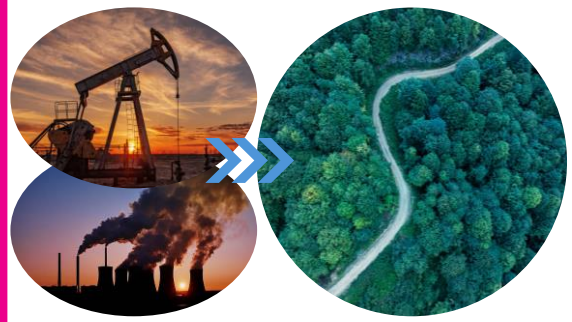
**Phenoxyethanol**
**COSING REF No:** 36522
Faint rose-like smell that is very pleasant
it is found in most of the products
Global market size $223 Mn

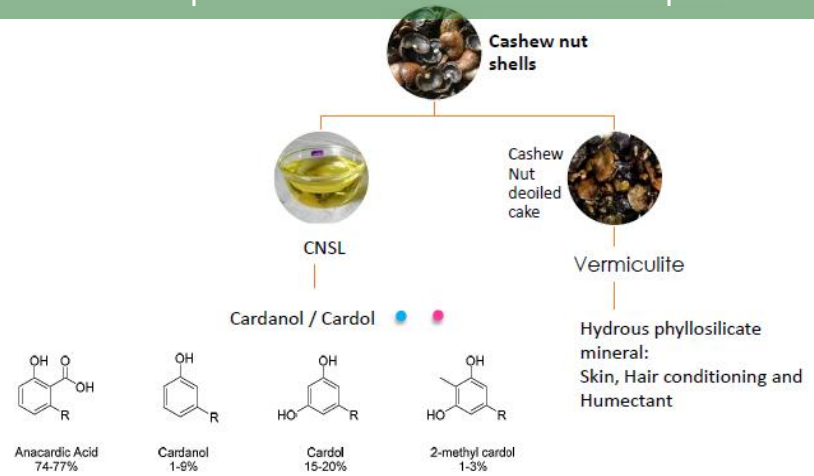
**Sodium Benzoate**
**COSING REF No:** 37735
Natural origin
Effectiveness in preservation
Global market size $1.55 Bn



## MATERIALS

**WHY:** Unique chemical composition of Cashew nut-shell liquid

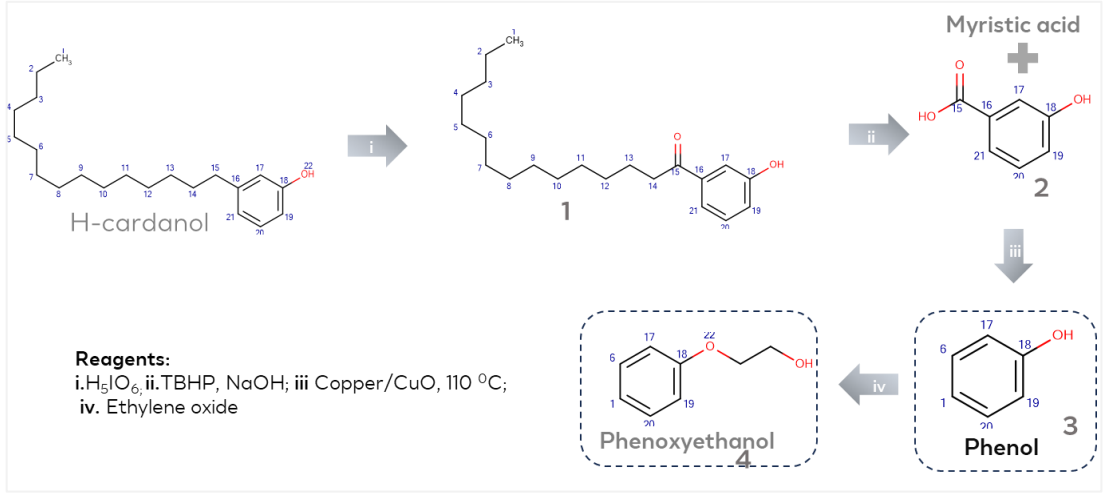


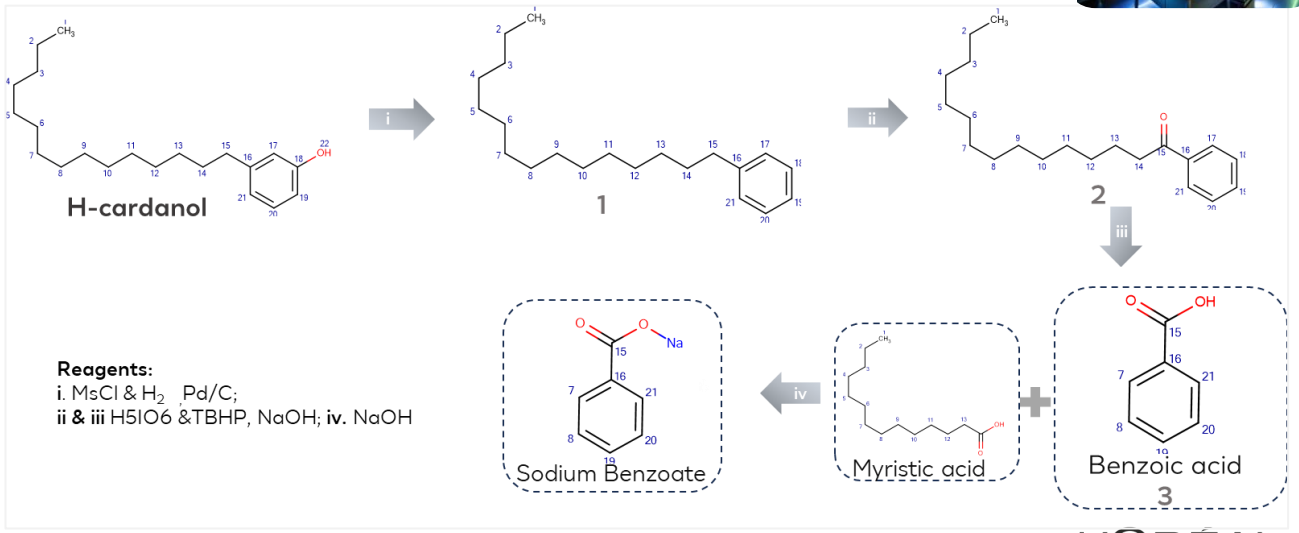



- Atom & Energy Efficient Processes
- Renewable Resource Utilization
- Safer & Milder processes
- Catalysts Reusability & Waste Minimization
- High Yields, Selectivity & Product Purity
- No Protection Deprotection Steps

## METHODOLOGY

- Chemical and catalysis approach to derive benzylic activation followed by oxidative cleavage t to obtain the aromatic as well as aliphatic carbons.
- Determination of stable isotopes and bio-based carbon content using EA-IRMS and radiocarbon (AMS
- )Assessment of bio-based carbon content: 14C by ASM (ASTMD6866), Bioplastics/USDA.

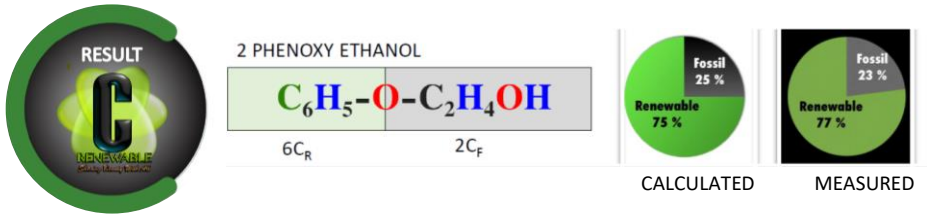


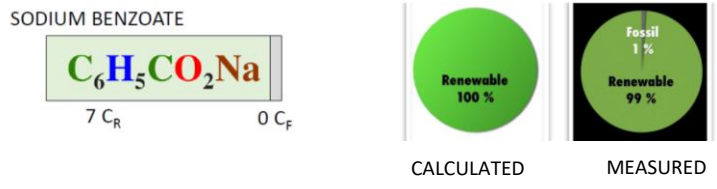



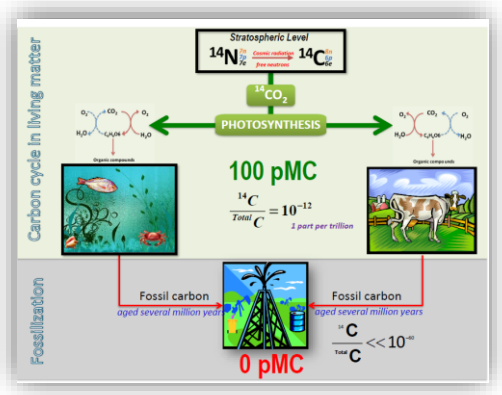

L'ORÉAL RESEARCH & INNOVATION SAPMENA

# RESULTS & DISCUSSION

- The yields of overall reaction scheme ~50-98%
- Catalyst recycling and optimization steps of oxidation followed by oxidative cleavage are being conducted
- The radiocarbon measurement is expressed as part of Modern Carbon (pMC).




## CONCLUSION

Here in we demonstrated a patented process for accessing Phenoxyethanol & Sodium benzoate from bio-feedstock (eg. Cashew Nutshell liquid) which enables us to produce high value ingredients in green chemical and atom economic approach and determined the renewable carbon content.

We extended the scope of the work to synthesize the phenolic derivatives of interest which are currently accessing by non-renewable sources and the work is underway


**REFERENCES**

1. India (NP) - 09 Jan 2025 – 20251100223; An efficient and atom economic strategy to derive Aromatic & aliphatic building blocks from Agri feedstock - Cashew nutshell liquid as a starting material to produce Bio building blocks phenoxyethanol and salicylic acid
2. 20 Dec 2024 – 202411101516; An efficient and atom economic strategy to derive Aromatic & aliphatic building blocks from Agri feedstock - Cashew nutshell liquid as a starting material to produce Bio building blocks like phenol, benzoic & myristic acid and the derivatives thereof
3. Phenolics_as_Active_Ingredients_in_Skincare_Produc; Molecules, 2025, 30(7), 1423; https://doi.org/10.3390/molecules30071423


L'ORÉAL RESEARCH & INNOVATION SAPMENA