

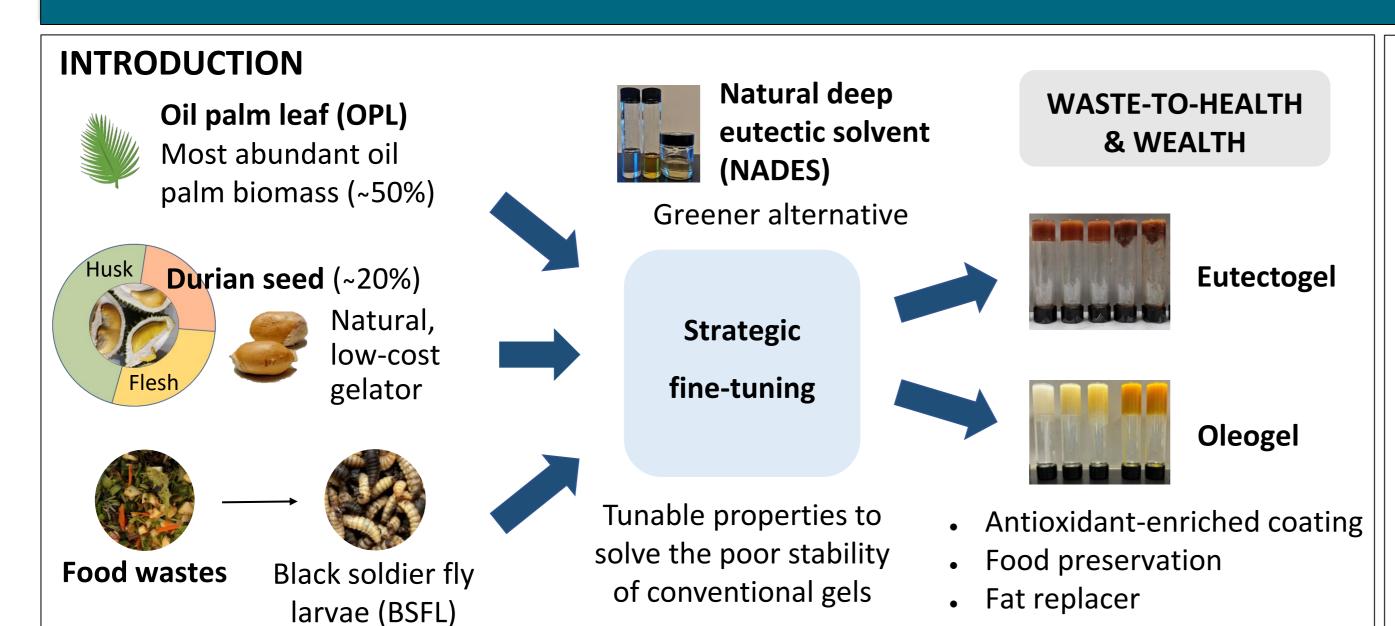
A WASTE-TO-HEALTH & WEALTH (W2HW) APPROACH: TUNING MULTIFUNCTIONAL AND SUSTAINABLE COLLOIDS (EUTECTOGEL & OLEOGEL)



Zhi Ling Chew | MSc, BEng (Hons), AMIChemE, Grad.Eng. (Chemical Engineering)

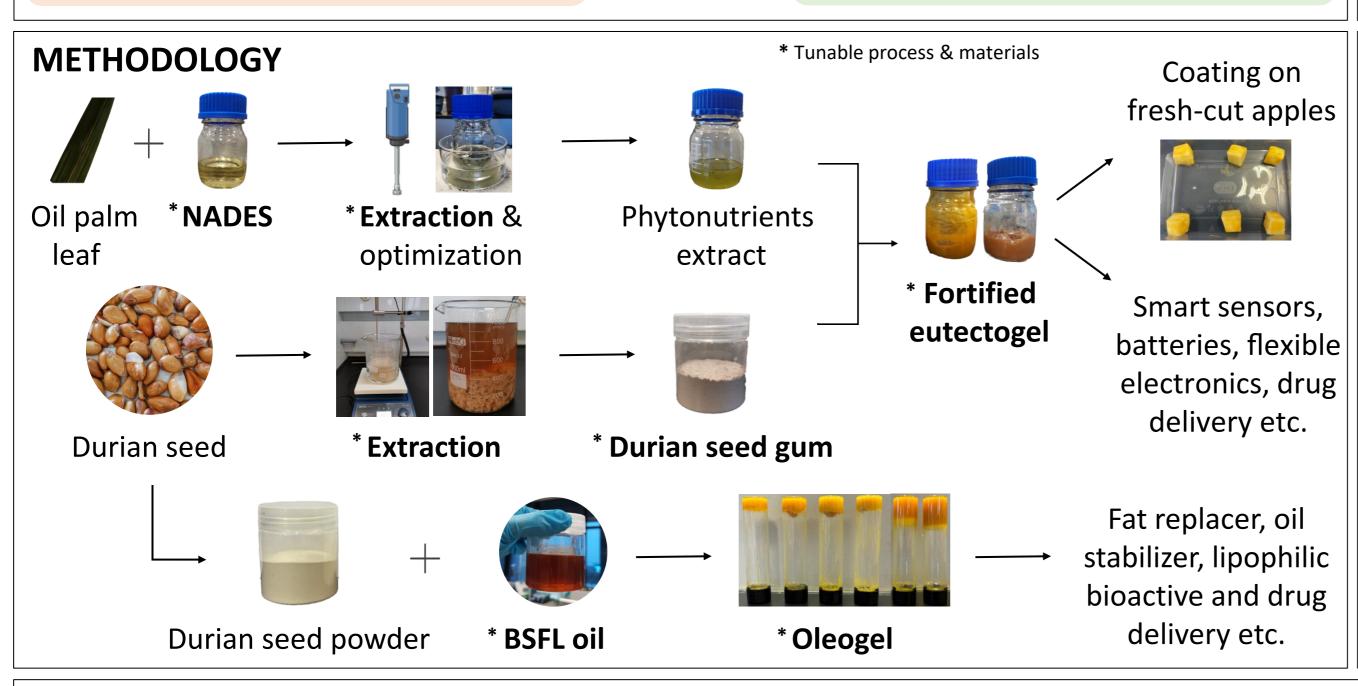
Priority Topic Area: Responsible Production, Innovation and Industry

INCREASE market value & sustainability



OBJECTIVES

- 1. To assess the process-structure-properties relationship of durian seed gum (DSG) for eutectogel formulation.
- 2. To synthesize eutectogel with desired properties and stability using tunable sugarbased NADES and DSG.
- 3. To optimize the extraction of phytonutrients from fresh OPL using NADES.
- 4. To investigate the stability of nutrients in DSG, NADES, and eutectogel.
- 5. To evaluate the food coating and preservation performances of eutectogel and fortified eutectogel containing OPL extract.
- 6. To develop oleogel using durian seed and BSFL oil for use as fat replacer.



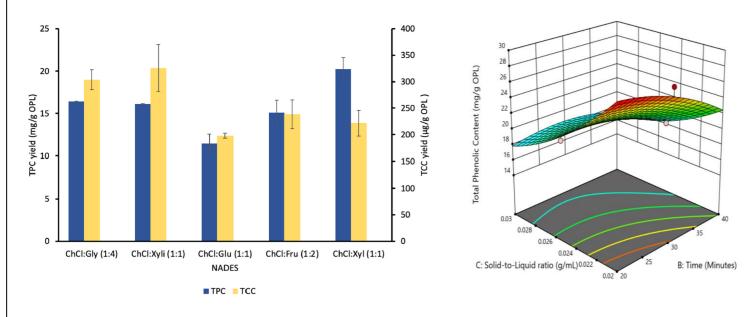
RESULTS & DISCUSSION

DSG	Chemical method	Cold method	Heating method	Dry seed method
Colour (L*	95.85	57.83	78.44	95.22
a*	-2.07	18.97	14.98	3.15
b*)	21.61	40.81	21.86	5.69
рН	5.68	8.83	5.93	7.52
WAC (g/g)	2.74	2.68	2.00	2.13
OAC (g/g)	0.48	0.99	0.51	0.79
Solubility (%)	16.07	21.77	10.36	9.83
Moisture (%)	9.76	10.59	5.94	3.99
Yield (%)	0.53	2.43	18.54	31.06

- Extraction process determined the yield, composition and properties of DSG
- Aqueous extraction from dry seed at high temperature and alkaline pH showed the most desired properties

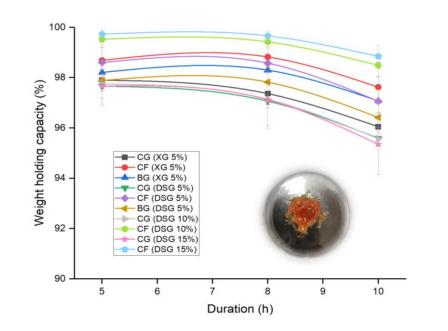
RESULTS & DISCUSSION

REDUCE waste & environmental damage



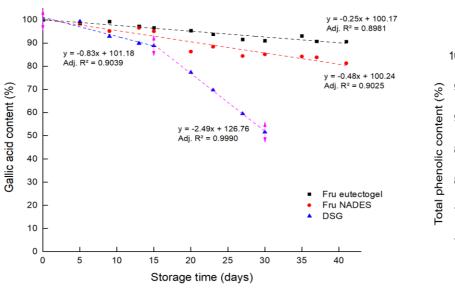
Choline chloride-fructose (1:2) NADES

Most stable with superior extraction efficiency of phytonutrients from OPL



- Stable and compatible upon 12 weeks of storage
- Good weight-holding capacity and barrier properties
- **Excellent thermostability** up to 200 °C
- Desired shear-thinning, viscoelastic and texture properties

- Eutectogel showed excellent protective and stabilization ability on phytonutrients
- Both eutectogel and fortified eutectogel extended shelf life of freshcut apples with better retention of phenolics



- **Eutectogel derived from ChCl-Fru** (1:2) NADES and 10% DSG 75 Storage time (days) ● Control ● Eutectogel ● Fortified Eutectogel
 - - BSFL oil resembled the properties of palm oil
 - Durian seed powder (containing starch and gum) displayed gelling ability in oleogel formulation with BSFL oil through emulsion- and foamtemplated approach

SIGNIFICANCE OF RESEARCH







2360 kg of biomass

(durian seed, OPL,

food wastes) valorized









1700 kg

CO₂-eq

reduction



Improve food security & nutrition

Increase market value by 5-15% in food,





costs (10-20%)

cosmetic, pharmaceutical industries

\$240 savings in

NEXT STEPS

- Develop bigel (oleogel/eutectogel) system as a sustainable co-delivery vehicle for hydrophilic and lipophilic active substances
- Perform life cycle assessment (LCA) and techno-economic analysis (TEA) for sustainable production of durian seedbased eutectogel, oleogel and bigel

Every 100 kg of eutectogel & 100 kg of oleogel produced

ENGINEERS

for Innovation

and Sustainability

AWARDS

REFERENCES

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