# OIL STRUCTURING FOR IMPROVING HEALTHY AND SUSTAINABLE DIETS: The Case Study Of Extra Virgin Olive Oil Oleogelation

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## BACKGROUND

The development of a **SUSTAINABLE FOOD SYSTEM** to favor the **TRANSITION TO HEALTHIER AND MORE SUSTAINABLE DIETS** is one of the major challenges of the modern food industry [1].

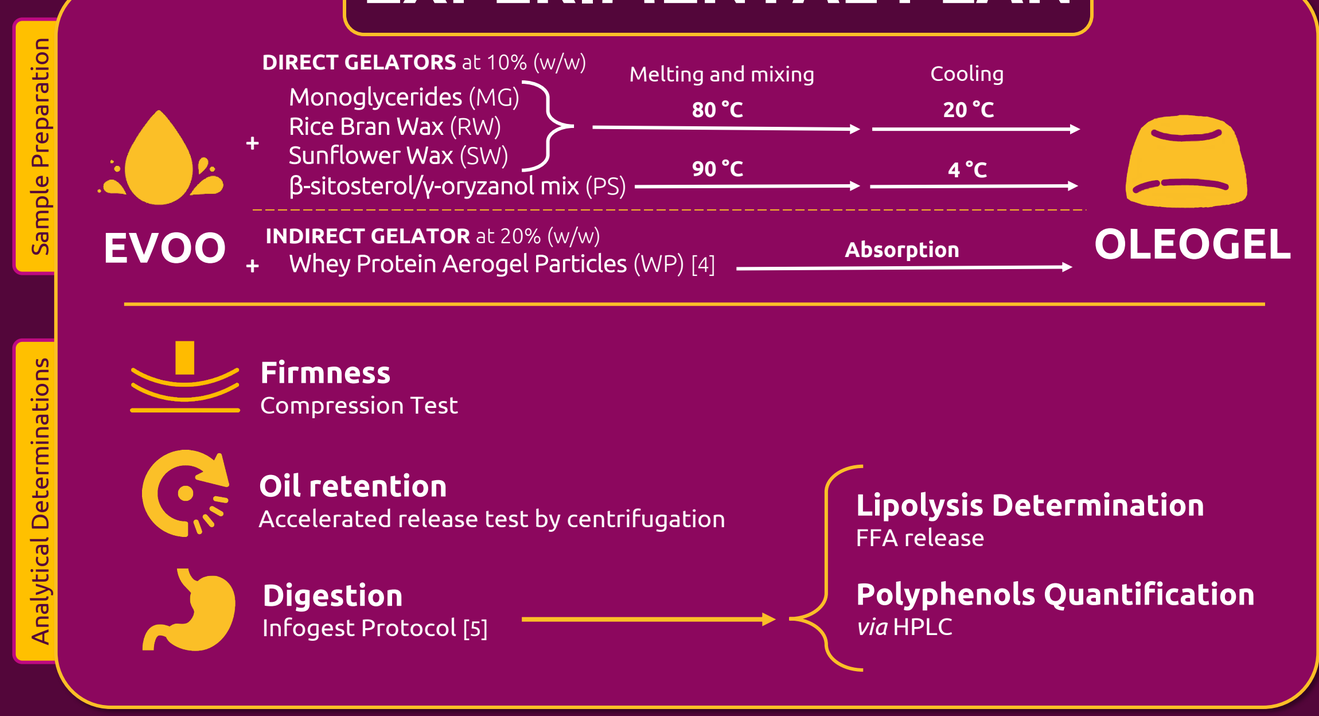
Oleogelation could be a strategy to face the challenges associated with fat consumption. In fact, this approach allows to convert liquid oils into solid-like materials. This could **ENHANCES THE NUTRITIONAL PROFILE** of lipid-containing food **BY LOWERING SATURATED FAT** levels while maintaining the same technological functionalities [2].

In this context, the use of extra virgin olive oil (**EVOO**) as a target oil to be gelled would be particularly interesting due to its **WELL-RECOGNIZED HEALTH-PROMOTING CAPACITY** [3].

## AIM

To **GEL EVOO** from different gelators and understand oleogels impact on the **LIPOLYSIS EXTENT** and **POLYPHENOLS' BIOACCESSIBILITY** upon *in vitro* gastrointestinal digestion

## EXPERIMENTAL PLAN




## RESULTS & DISCUSSION

Technological Functionalities

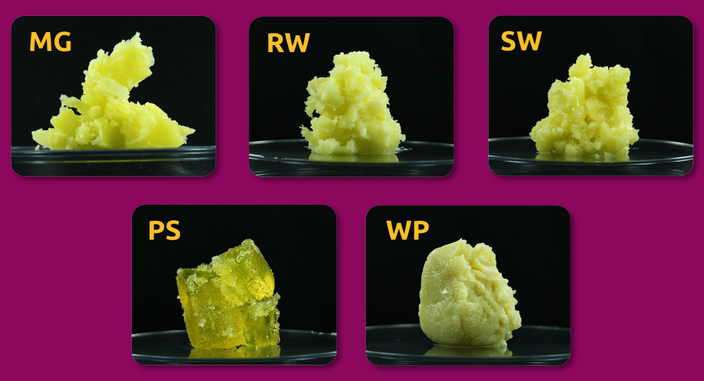



**Figure 1. M**acroscopic appearance of MG-, RW-, SW-, PS-, WP-based oleogels.

All the considered gelators presented good performances in structuring EVOO (Figure 1 and Table 1). However, as expected based on the literature, the diversity in network nano- and micro-structure led to a different macrostructure. PS formed a tubular-like network with the highest firmness. Among crystalline network, SW was the strongest gel followed by RW and MG. The WP-based gel, made of a proteins network, showed low firmness.

**Table 1.** Oil retention and firmness of MG-, RW-, SW-, PS-, WP-based oleogels.

| Sample | Oil retention (%) | Firmness (g) |
|---|---|---|
| MG | 99.97 ± 0.01 $^{a}$ | 33.6 ± 2.5 $^{e}$ |
| RW | 100.0 ± 0.00 $^{a}$ | 115.0 ± 3.0 $^{d}$ |
| SW | 99.97 ± 0.03 $^{a}$ | 532.7 ± 23.8 $^{b}$ |
| PS | 99.96 ± 0.01 $^{a}$ | 2534.0 ± 71.6 $^{a}$ |
| WP | 100.0 ± 0.00 $^{a}$ | 96.7 ± 6.8 $^{c}$ |

Superscript letters (a–e) indicate significant differences among oleogels ($p < 0.05$).

Oleogel Digestibility

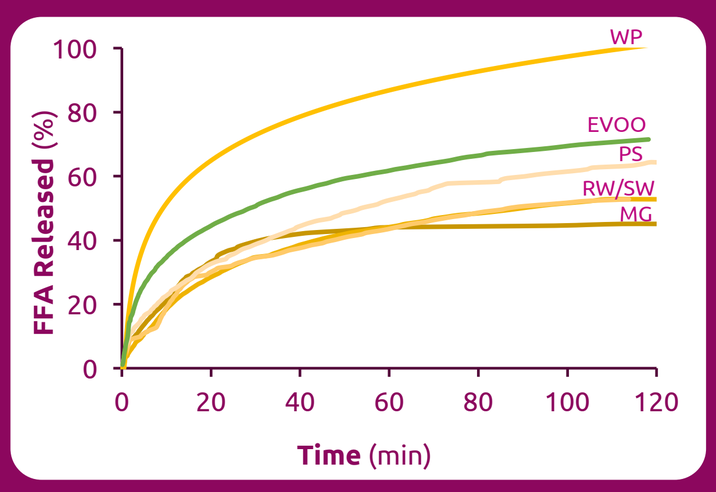



**Figure 2.** FFA release of MG-, RW-, SW-, PS-, WP-based oleogels and unstructured EVOO upon *in vitro* digestion.

The oil lipolysis kinetics was affected by oleogelation. Direct gelators reduced lipolysis probably by acting as a physical barrier to lipase. On the other side, the oil entrapped in the WP network showed an increased digestibility considered a consequence of the destructuring behavior of proteins in gastrointestinal conditions (Figure 2).

**Table 2.** Bioaccessibility of oleogels and unstructured EVOO.

| Samples | Hydroxytyrosol (%) | Tyrosol (%) |
|---|---|---|
| MG | 7.0 ± 1.75 $^{b}$ | 26.1 ± 0.97 $^{bc}$ |
| RW | 5.4 ± 0.49 $^{b}$ | 22.8 ± 1.77 $^{c}$ |
| SW | 5.3 ± 0.66 $^{b}$ | 31.6 ± 3.25 $^{b}$ |
| PS | 1.2 ± 0.08 $^{c}$ | 25.6 ± 1.81 $^{c}$ |
| WP | 17.0 ± 4.50 $^{a}$ | 52.3 ± 1.96 $^{a}$ |
| Oil | n.d. | 48.1 ± 3.38 $^{a}$ |

Superscript letters (a–c) indicate significant differences among oleogels ($p < 0.05$). "n.d." means "not detected".

Even polyphenol bioaccessibility was impacted by oleogelation. PS, MG, and waxes-based oleogels showed similar polyphenol bioaccessibility, in any case, lower than unstructured oil. Differently, WP-based oleogel demonstrated an increase in bioaccessibility (Table 2). Being polyphenol surface-active molecules, different interactions among polyphenols and gelators can be hypothesized in affecting gastrointestinal fate.

## CONCLUSIONS

The entrapment of EVOO into oleogel with different network structures allowed the **modulation** of **FFA release** and **polyphenol bioaccessibility** during *in vitro* digestion. Oleogels can thus represent a promising strategy to tailor lipid digestibility and polyphenols absorption.

## REFERENCES

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