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Novel food-grade bigels structured with wax from the native stingless bee (*Scaptotrigona mexicana*) and canola oil

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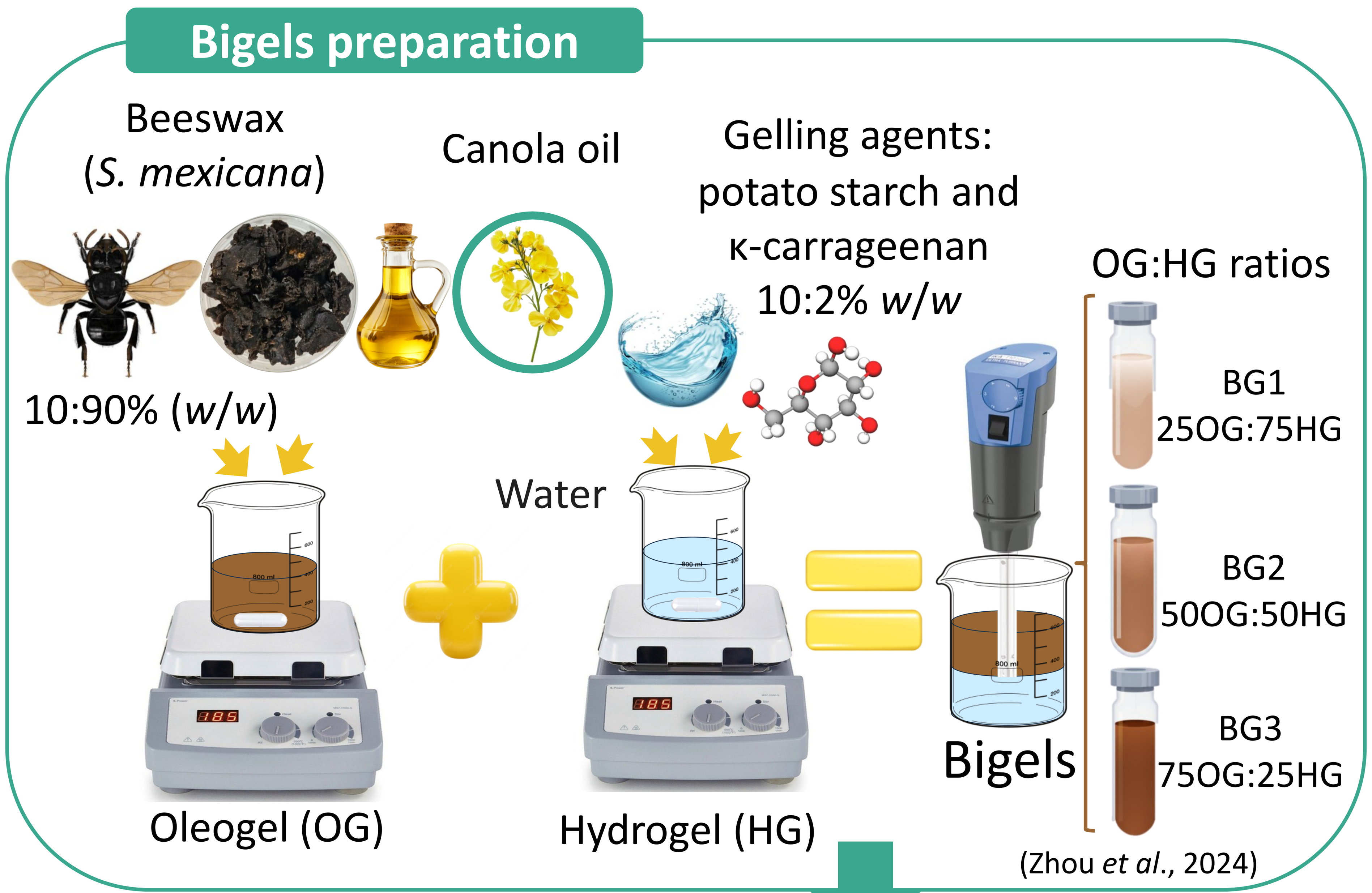
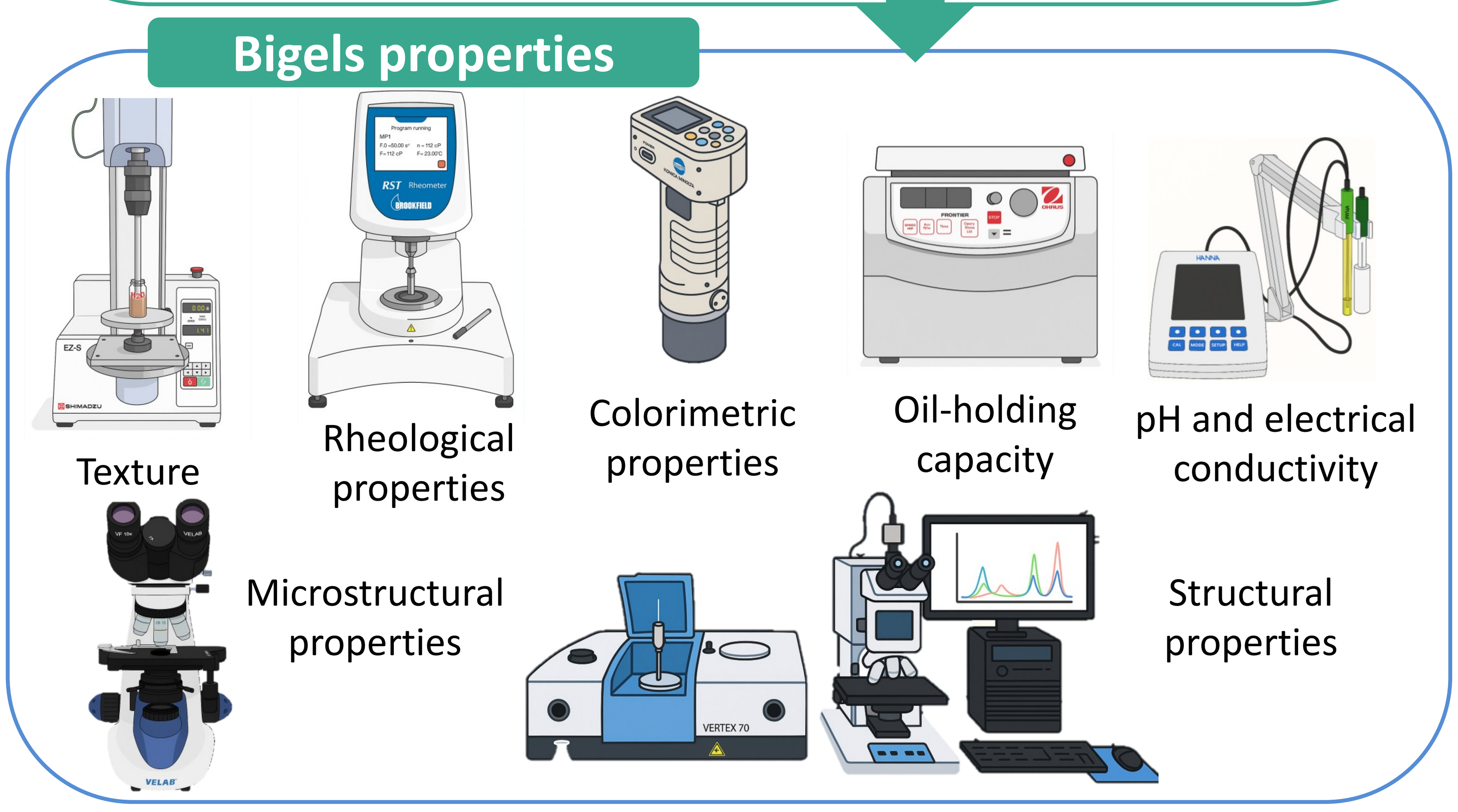
INTRODUCTION & AIM

Bigels (BGs) are biphasic systems combining oleogel (OG) and hydrogel (HG) networks and are emerging as promising fat replacers in food systems. In this work, food-grade BGs were developed using *Scaptotrigona mexicana wax*—a native stingless bee species of ecological and biocultural importance—as an oleogelation agent.

METHOD





RESULTS & DISCUSSION

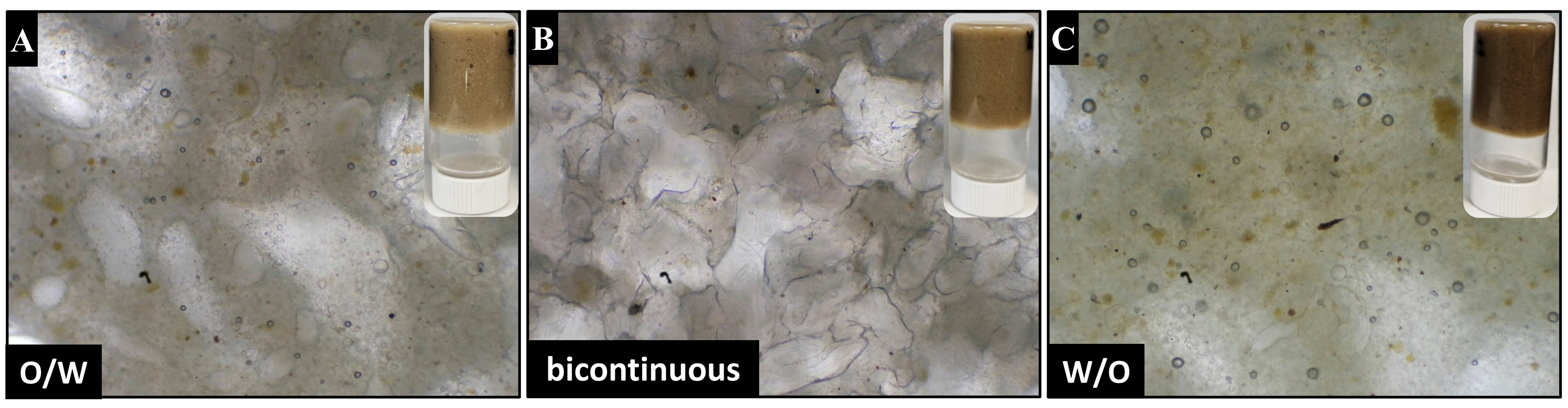


Fig. 1. Tube inversion test and optical micrographs (10×) of: **A.** BG1 (25OG:75HG), **B.** BG2 (50OG:50 HG), and **C.** BG3 (75OG:25HG).

RESULTS & DISCUSSION

Table 1 Physicochemical and colorimetric properties of bigels with different OG:HG ratios

Properties/ Formulation	BG1	BG2	BG3
MC %	67.44 ± 0.59^{a}	45.99 ± 0.12^{b}	23.06 ± 1.26^{c}
pH	4.83 ± 0.13^{a}	4.32 ± 0.16^{b}	3.88 ± 0.09^{c}
Hardness (N)	0.52 ± 0.01^{a}	0.17 ± 0.001^{b}	0.11 ± 0.001^{c}
Viscosity (Pa·s)	0.153 ± 0.007^{a}	0.091 ± 0.007^{b}	0.059 ± 0.0008^{c}
L*	48.28 ± 1.47^{a}	39.52 ± 1.48^{b}	26.58 ± 1.05^{c}
a*	7.12 ± 0.60^{b}	8.80 ± 0.17^{a}	7.70 ± 0.49^{ab}
b*	23.52± 0.40^{a}	22.55 ± 0.72^{a}	17.83 ± 1.24^{b}

BG1 (25OG:75HG); BG2 (50OG:50HG); BG3 (75OG:25HG). MC: Moisture Content. Values are expressed as mean ± SD (*n*=3). ^{abc}Different superscripts in the same column indicate statistically significant differences (p<0.05).

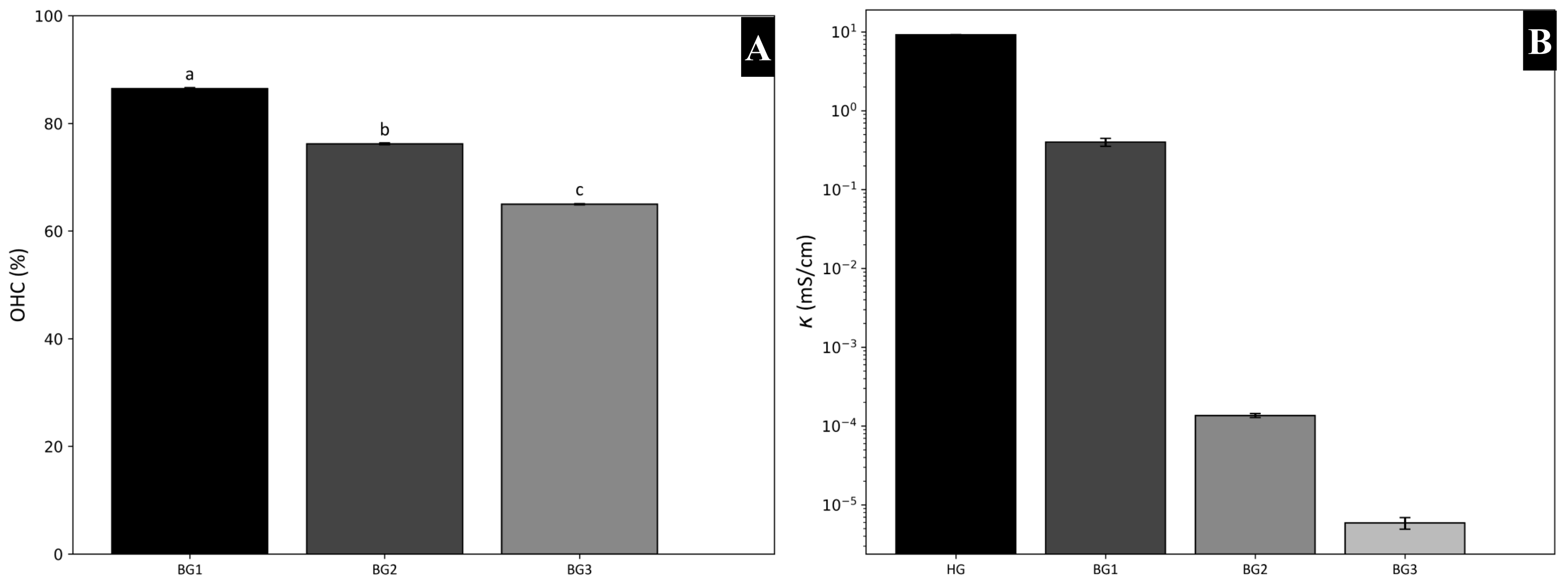


Fig. 2. A. Oil holding capacity (OHC); **B.** Electrical conductivity of BG1 (25OG:75HG), BG2 (50OG:50HG) and BG3 (75OG:25HG). Values are expressed as mean ± SD (*n*=3). ^{abc}Different superscript letters indicate statistically significant differences (p<0.05).

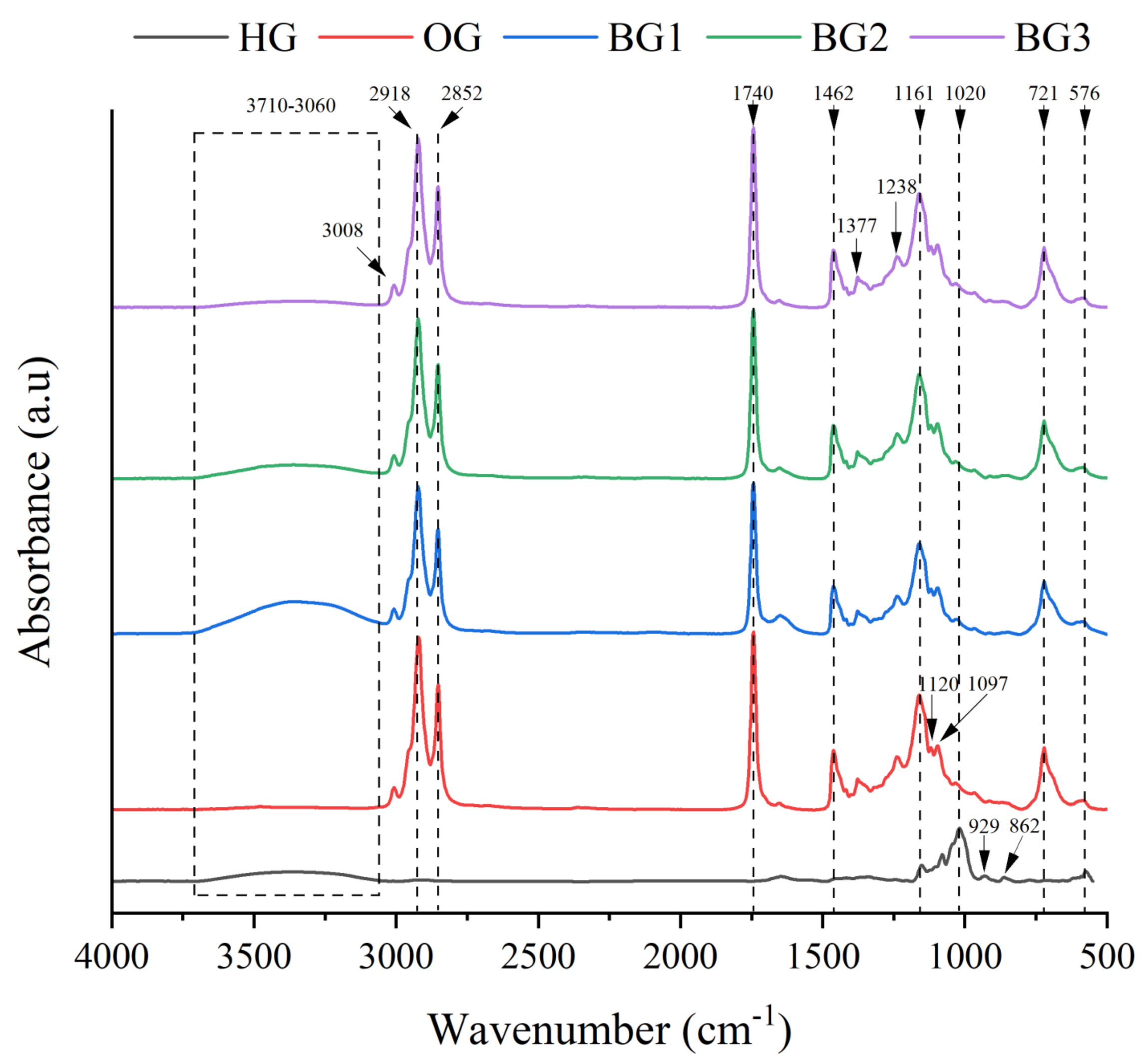


Fig. 3. FTIR spectra of hydrogel (HG), oleogel (OG), BG1 (25OG:75HG), BG2 (50OG:50HG) and BG3 (75OG:25HG).

CONCLUSION

S. mexicana beeswax proved to be an effective oleogelator for developing stable food-grade OGs and BGs with tunable properties depending on OG:HG ratios, holding promise as fat replacers.

FUTURE WORK / REFERENCES

Future research could enhance BG performance by incorporating polymers that improve HG phase stability.

Zhou M, Li B, Wu A, Hu Z, Liu J, Wang Y, Liu H. Preparation of a bigel system based on κ-carrageenan hydrogel and beeswax oleogel and the effect of starch on the bigel properties. LWT. 205:116516 (2024).