

Biopolymer from Water Kefir as a Potential Clean-Label Ingredient for

Health Applications: Evaluation of New Properties

Supplementary Materials

2.2 Evaluation of the growth rate (GGR) of water kefir grains

$$GGR (\%) = \frac{\text{Final grain mass} - \text{Initial grain mass}}{\text{Initial grain mass}} \times 100 \quad (\text{Eq.S1})$$

2.6 Functional properties

2.6.1 Emulsifying ability (EA) and emulsifying stability (ES)

$$EA (\%) = \frac{\text{Initial emulsion volume}}{\text{Total volume}} \times 100 \quad (\text{Eq.S2})$$

$$ES (\%) = \frac{\text{Final emulsion volume}}{\text{Initial emulsion volume}} \times 100 \quad (\text{Eq.S3})$$

2.6.2 Water holding capacity (WHC)

$$WHC (\%) = \frac{\text{Sample mass after water absorption}}{\text{Dry sample mass}} \times 100 \quad (\text{Eq.S4})$$

2.6.3 Water solubility (Sol)

$$Sol (\%) = \frac{\text{Supernatant mass after drying}}{\text{Dry sample mass}} \times 100 \quad (\text{Eq.S5})$$

2.6.4 Foaming ability (FA) and foam stability (FS)

$$FA (\%) = \frac{\text{Initial foam volume}}{\text{Total suspension volume}} \times 100 \quad (\text{Eq.S6})$$

$$FS (\%) = \frac{\text{Final foam volume}}{\text{Total suspension volume}} \times 100 \quad (\text{Eq.S7})$$

2.6.5 Swelling index

$$Int (g/g) = \frac{\text{Mass of swollen sample} - \text{Mass of dried sample}}{\text{Mass of dried sample}} \quad (\text{Eq.S8})$$

2.7 Photostability study

$$\% \text{ photodegradation} = [(A_0 - A_1)/A_0] \times 100 \quad (\text{Eq.S9})$$

Where: A_0 is the absorbance at the wavelength at the initial time, and A_1 is the absorbance at the wavelength at the irradiation time.

$$\eta_{sp} = \eta_{rel} - 1 \quad (\text{Eq.S10})$$

$$\eta = \frac{\sqrt{2}}{C} (\eta_{sp} - \ln \eta_{rel})^{1/2} \quad (\text{Eq.S11})$$

Where sp and rel correspond to the specific and relative viscosity, respectively, and C corresponds to the concentration in g. dL⁻¹.

Table S1. Functional properties of EPSwk.

Functional properties	Results
Sol (%)	53.7 ± 2.0
EA (%)	89.3 ± 4.0
ES (%)	83.6 ± 1.8
WHC (%)	704.7 ± 53.3
FA (%)	26.7 ± 2.9
FS (%)	18.3 ± 4.0
Int (g/g)	43.1 ± 16.0

Sol - water solubility; EA - emulsifying ability; ES - emulsifying stability; WHC - water holding capacity; FA - foaming ability; FS - form stability; Int. - swelling index.

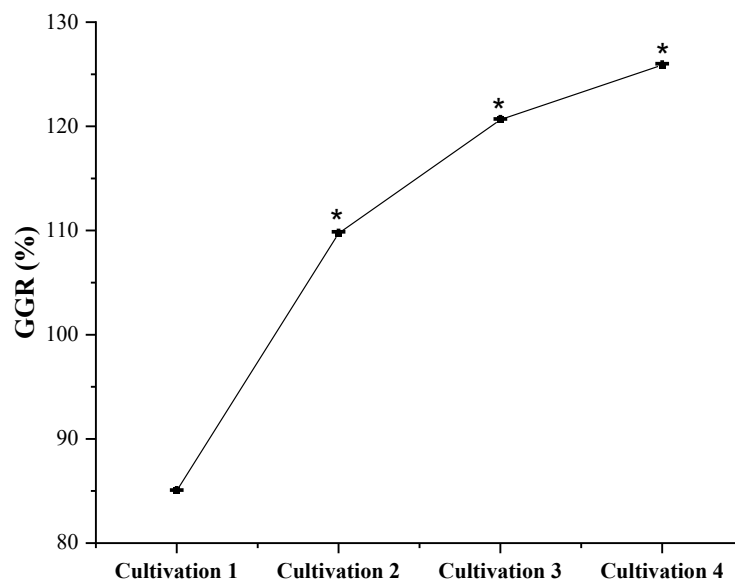


Figure S1. Monitoring the growth rate of water kefir grains in natura. * $p < 0.05$ compared to Cultivation 1 by the *Student's t-test*.

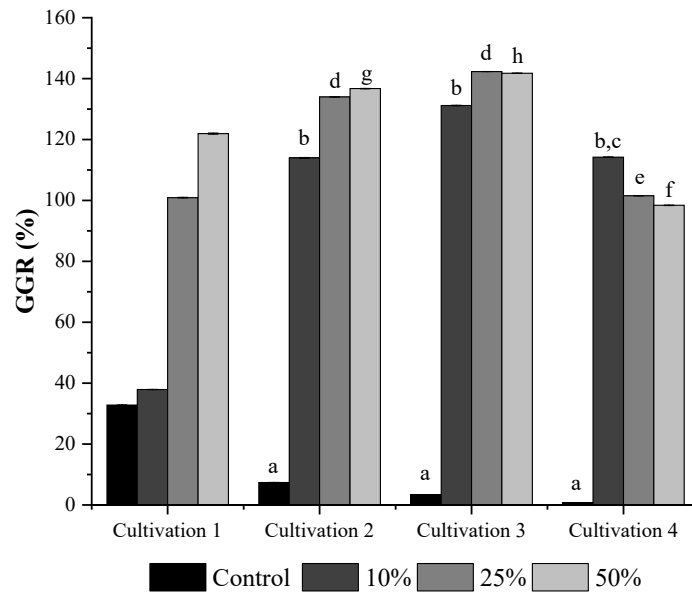


Figure S2. Monitoring the growth rate of water kefir grains after the freezing process with the addition of different concentrations of glycerol. a) $p < 0.05$ compared to control of the cultivation 1 by the *Student's t-test*. b) $p < 0.05$ compared to 10% glycerol of the cultivation 1 by the *Student's t-test*. c) $p < 0.05$ compared to 10% glycerol between cultivations 3 and 4 by the *Student's t-test*. d) $p < 0.05$ compared to 25% glycerol of the cultivation 1 by the *Student's t-test*. e) $p < 0.05$ compared to 25% glycerol among cultivations 2 and 3; 2 and 4; and 3 and 4 by the *Student's t-test*. f) $p < 0.05$ compared to 50% glycerol between cultivation 1 and 4 by the *Student's t-test*. g) $p < 0.05$ compared to 50% glycerol between cultivations 2 and 4 by the *Student's t-test*. h) $p < 0.05$ compared to 50% glycerol between cultivations 3 and 4 by the *Student's t-test*.

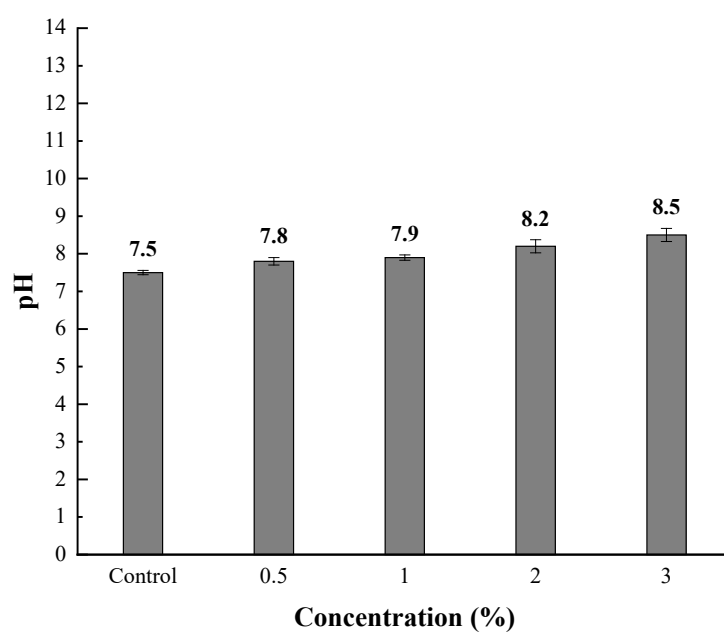


Figure S3. pH values of EPSwk in different concentrations.

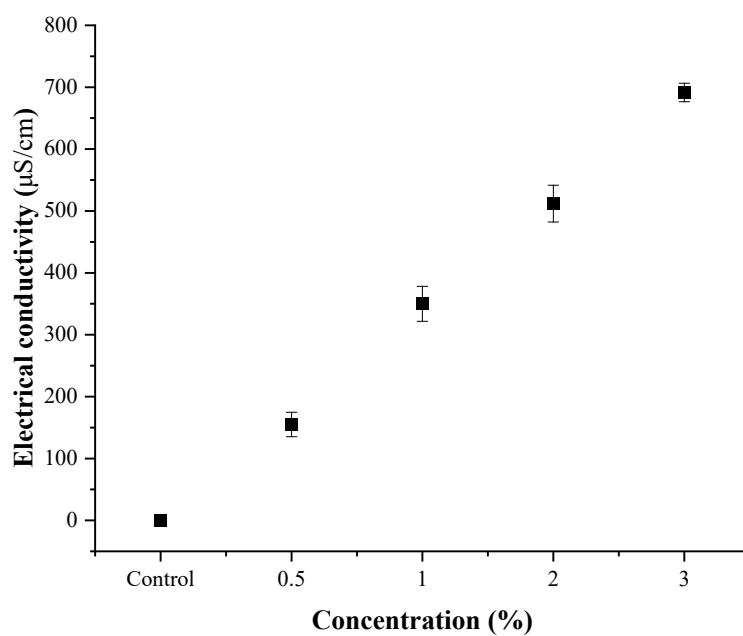


Figure S4. Electrical conductivity of EPSwk in different concentrations.

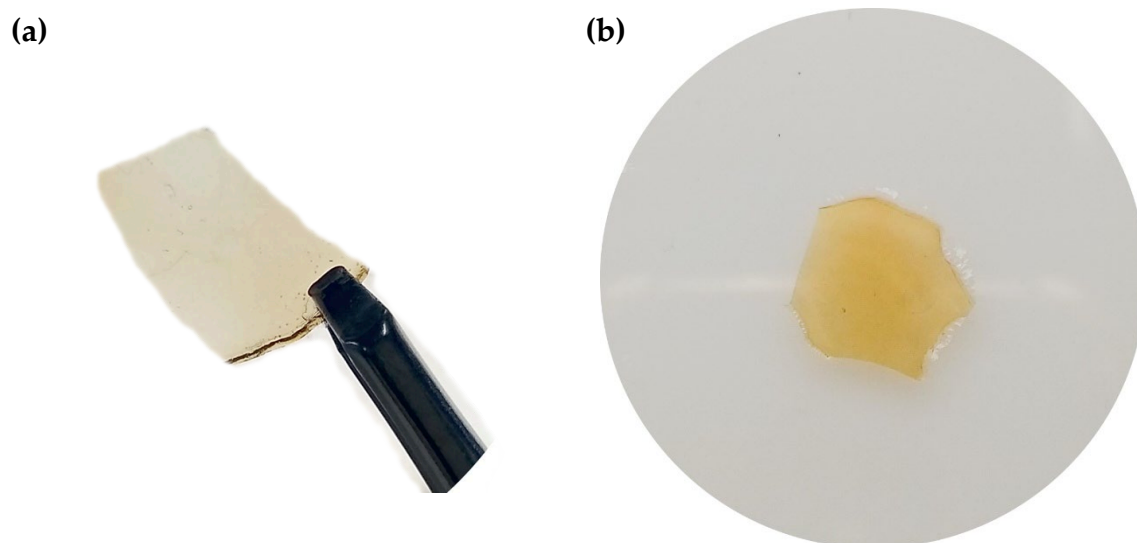


Figure S5. (a) Film of EPSwk without the addition of plasticizer. (b) Film of EPSwk with 10% of glycerol.

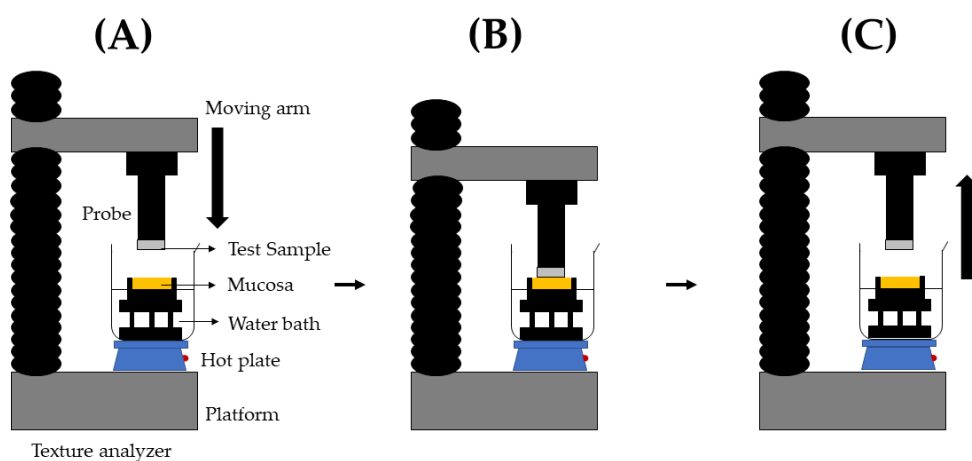


Figure S6. Schematic diagram of the mucoadhesiveness test by the texture analyzer. (A) The probe with the sample was moved downward; (B) The sample was attached to porcine buccal mucosa; (C). The probe moves up at a specified speed.

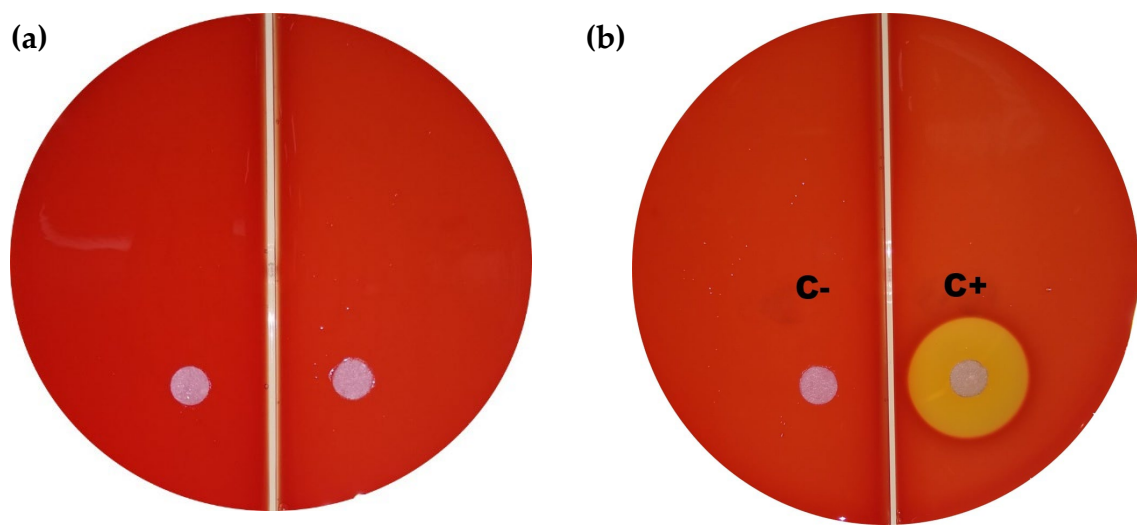


Figure S7. (a) Hemocompatibility analysis of EPSwk. **(b)** Negative and positive controls.