

STRUCTURAL CHARACTERIZATION OF EDIBLE FILMS WITH INCORPORATED LACTIC ACID BACTERIA FROM DAIRY BY-PRODUCTS

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INTRODUCTION & AIM

Recent studies have demonstrated that edible films serve as an effective vehicle for delivering functional components such as probiotics and prebiotics. However, the incorporation of probiotic lactic acid bacteria (LAB) may alter the structural and functional properties of these films.

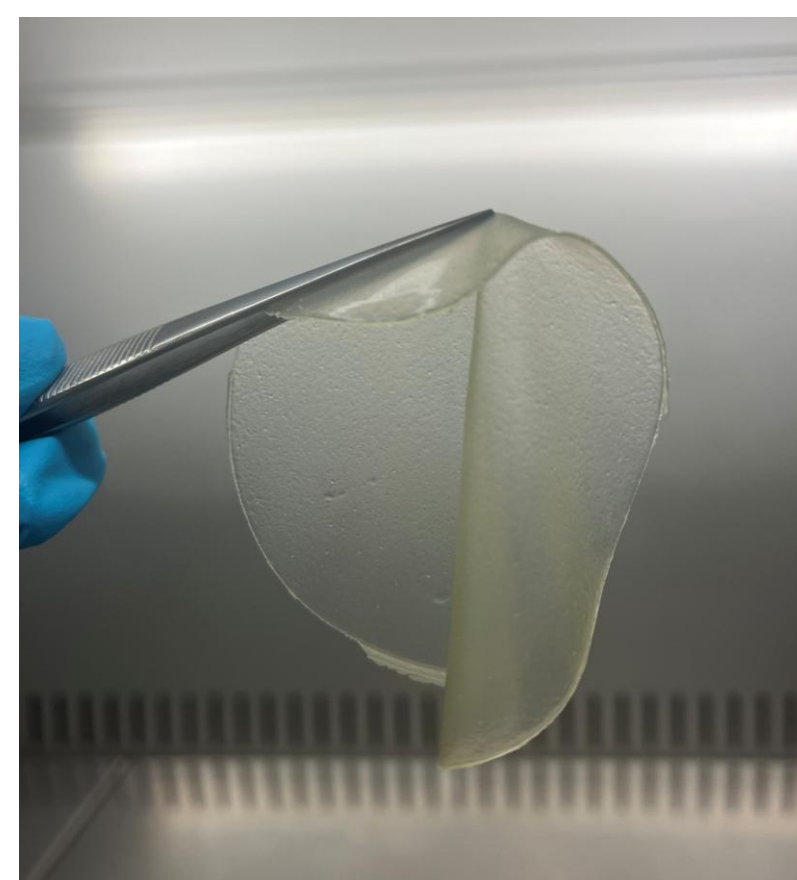


Fig. 1 An example of edible film

METHODS

In this study, edible films formulated from liquid acid whey protein concentrate (LAWPC), or liquid acid whey permeate (LAWP), containing sugar beet pectin, Tween 80, sunflower oil, and glycerol were enriched with *Lactocaseibacillus paracasei* and *Lactobacillus helveticus* (~7 log CFU/g). The films were evaluated for their physicochemical attributes, including thickness, tensile strength, elongation-at-break, water solubility, moisture content, and water vapor permeability (WVP).

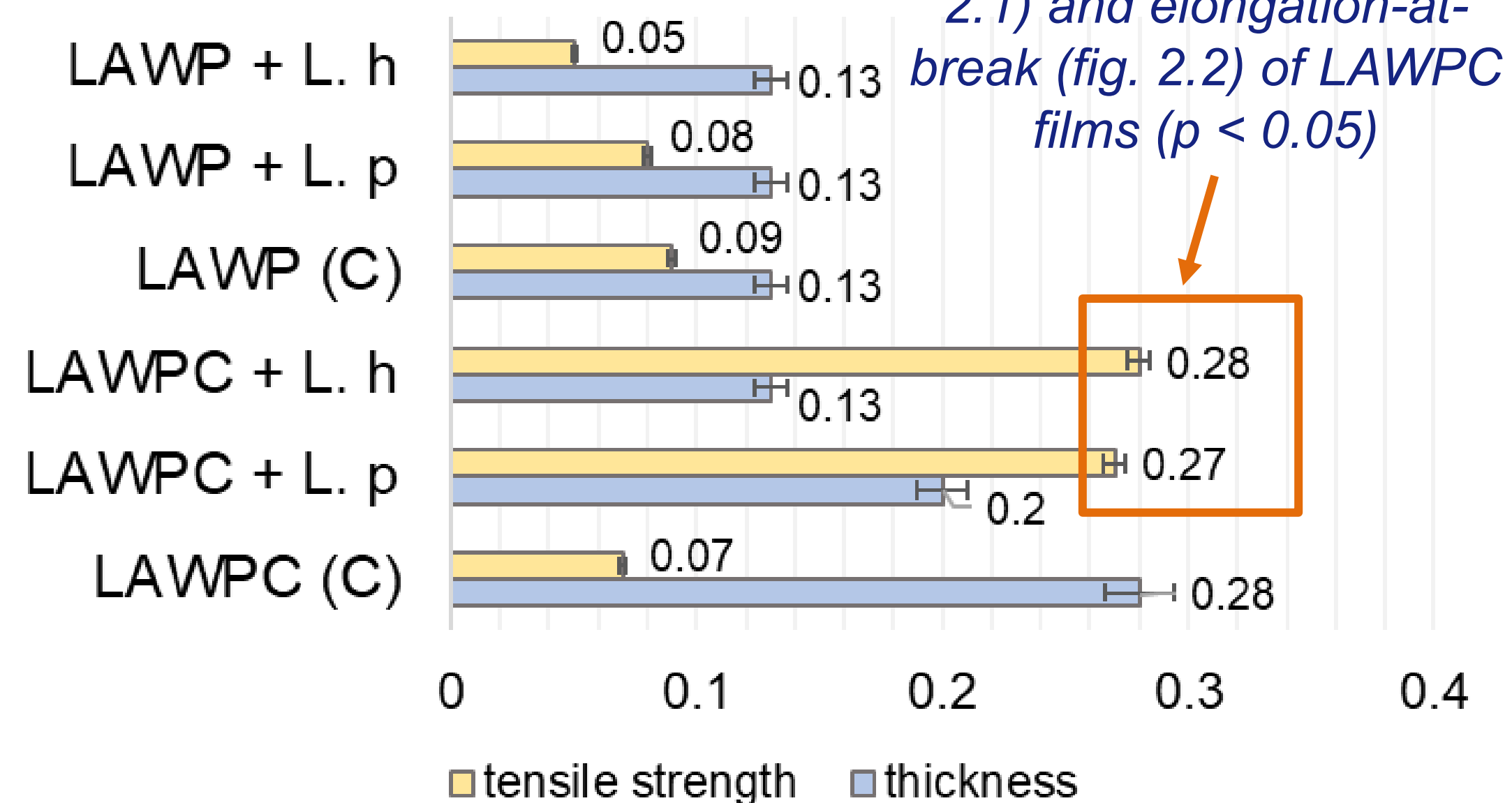
RESULTS & DISCUSSION

Table 1 Water solubility and WVP of the different films tested

Film samples	Water solubility (%)	WVP (g/(m.s.Pa))
LAWP + L. h	72.17 ± 6.18 ^a	2.59 × 10 ⁻⁶ ± 1.22 × 10 ^{-6a}
LAWP + L. p	89.91 ± 5.61 ^b	2.85 × 10 ⁻⁶ ± 1.24 × 10 ^{-6a}
LAWP (C)	69.70 ± 5.07 ^a	2.69 × 10 ⁻⁶ ± 1.14 × 10 ^{-6a}
LAWPC + L. h	72.67 ± 6.45 ^a	1.87 × 10 ⁻⁶ ± 7.06 × 10 ^{-7a}
LAWPC + L. p	69.01 ± 2.81 ^a	1.99 × 10 ⁻⁶ ± 8.69 × 10 ^{-7a}
LAWPC (C)	66.56 ± 1.05 ^a	2.29 × 10 ⁻⁶ ± 6.20 × 10 ^{-7a}

LAWPC – film made of liquid acid whey protein concentrate; LAWP – film made of liquid acid whey permeate; C – control; L. h – *Lactobacillus helveticus*; L. p – *Lactocaseibacillus paracasei*. Different lowercase letters indicate significant differences ($p < 0.05$) between samples. Results are mean ± SD

(1)



(2)

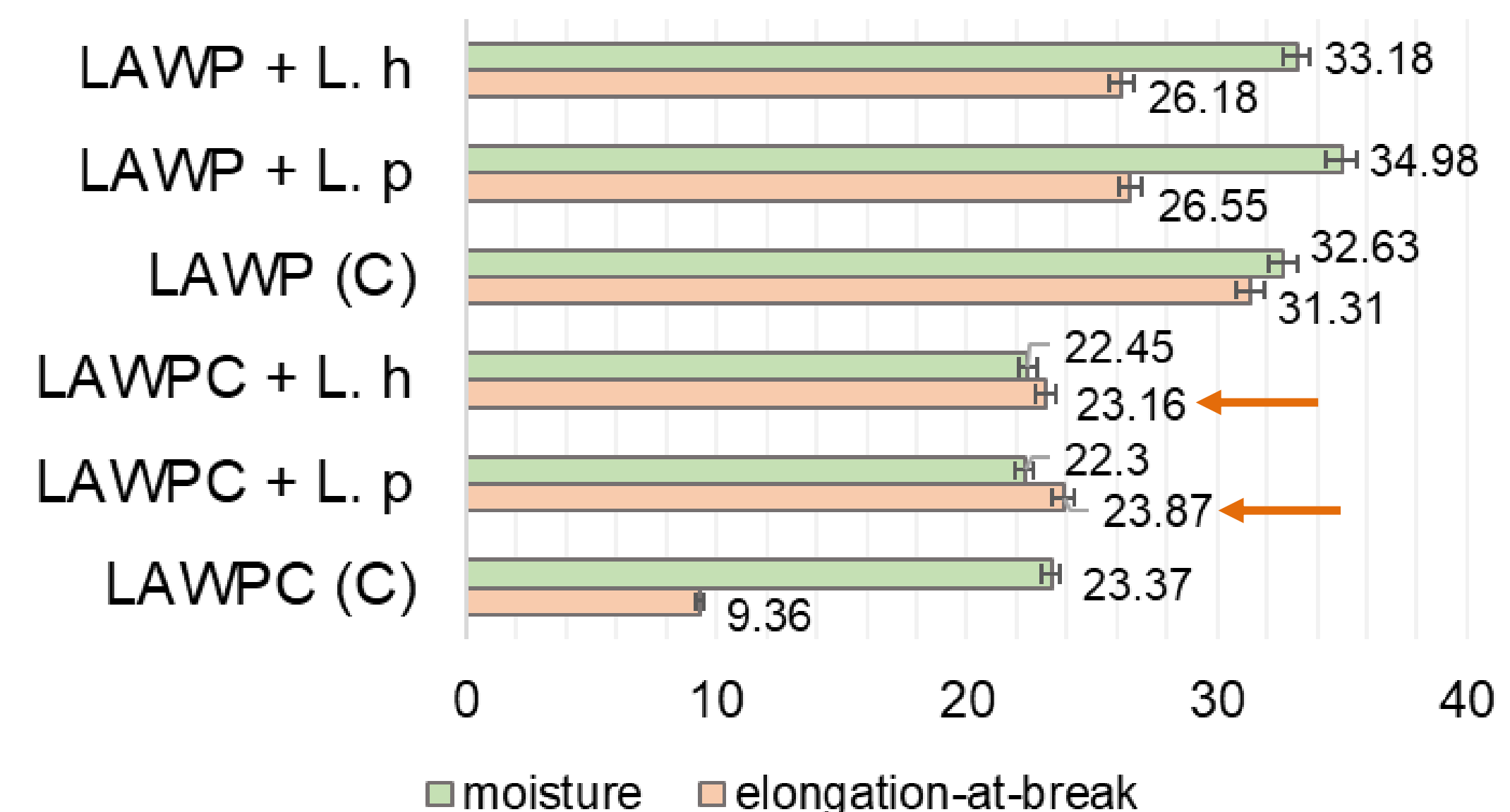


Fig. 2 Tensile strength and thickness (1), moisture content and elongation-at-break (2) of the different films tested. LAWPC – film made of liquid acid whey protein concentrate; LAWP – film made of liquid acid whey permeate; C – control; L. h – *Lactobacillus helveticus*; L. p – *Lactocaseibacillus paracasei*. Results are mean ± SD

CONCLUSION

These findings indicate that the combination of dairy by-products and LAB in edible films has a positive effect on their physicochemical properties. Moreover, embedding the bacteria in an edible hydrocolloid matrix provides an excellent way to integrate probiotics into food products.