

Mechanical properties

The TS (MPa) was calculated by following equation:

$$TS \text{ (MPa)} = \frac{P_{\max}}{A} \quad \text{Eq. (1)}$$

where P_{\max} is the maximum force (N) necessary to pull the sample apart, and A is the initial cross-sectional area of the sample film (m^2) determined by multiplying the film width by the film thickness.

The percentage elongation at break point is the amount of uni-axial strain at fracture, was calculated by following equation:

$$EAB(\%) = \frac{(l_b - l_0)}{l_0} \times 100 \quad \text{Eq. (2)}$$

where l_b is the film elongation at the moment of failure and l_0 is the initial grip length (3 cm) of samples multiplied by 100.

Modulus of elasticity (E) was expressed in MPa and was calculated from the slope of the linear region of an engineering stress-strain curve:

$$E \text{ (MPa)} = \frac{\Delta S}{\Delta e} \quad \text{Eq. (3)}$$

where ΔS is the change in tensile stress and Δe is the change in tensile strain over the elastic region.

Water vapour permeability

Briefly, films were sealed on an aluminium permeation cup containing dried silica gel (0 % RH) with silicone vacuum grease and rubber gasket, and held with four screws around the cup's circumference. After taking the initial weight of the test cups, they were placed in a desiccator containing the distilled water (30 °C, 50±2 % RH), followed by weighing the test cup to the nearest 0.0001 g with an electronic scale (Sartorius Corp.) after every 1 h intervals over an 8 h period.

Film solubility

Two pieces of conditioned films ($3 \times 2 \text{ cm}^2$) previously dried until constant weight, were weighed and immersed in 10 mL of distilled water containing 0.1 % (w/v) sodium azide in 50 mL screw cap tubes. The tubes were capped, placed in a shaking water bath (Heidolph UNIMAX 1010, Schwabach, Germany) and mixtures were shaken continuously at room temperature for 24 h. Undissolved debris was obtained after centrifugation at $3000 \times g$ for 10 min at 25 °C using a centrifuge (Allegra 25R Centrifuge, Beckman Coulter, Krefeld, Germany). The pellets were dried at 105 °C for 24 h to obtain the dry unsolubilised film matter.

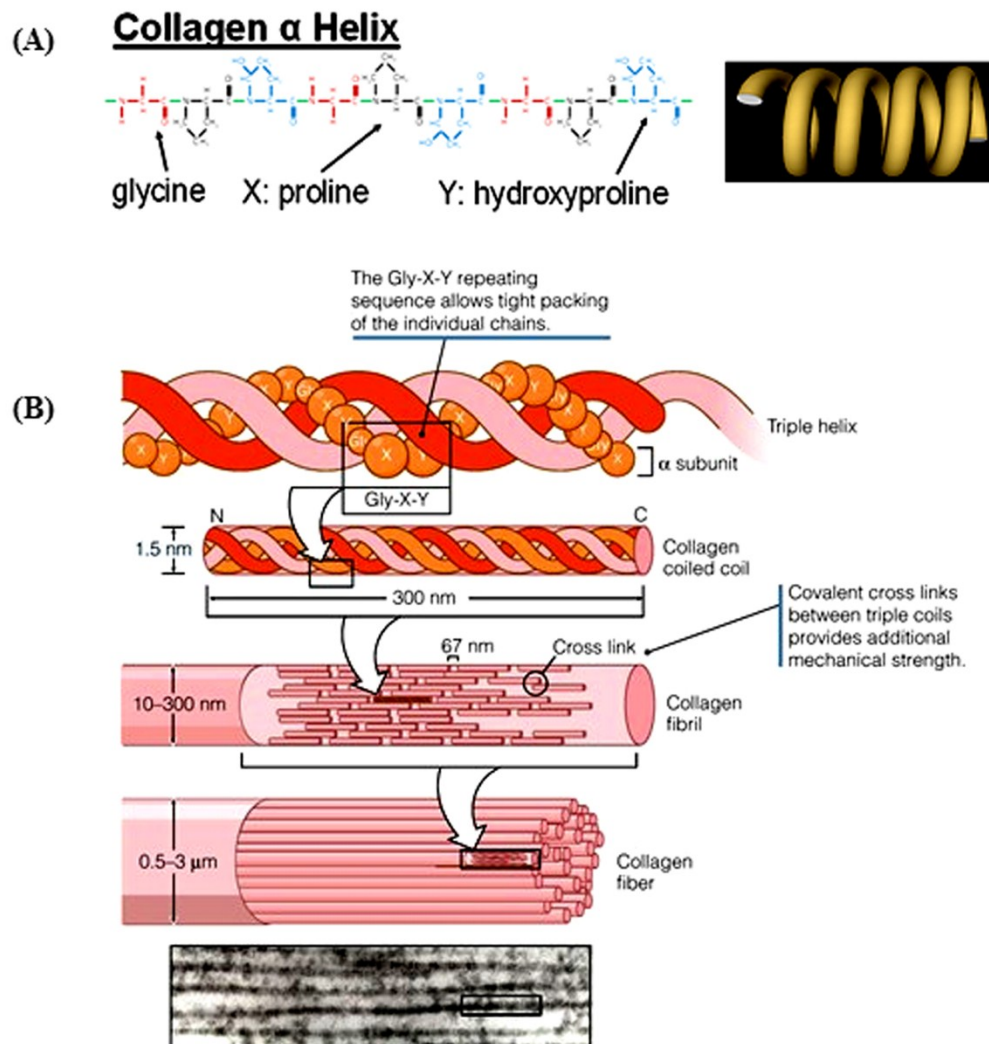


Fig. S1. Collagen α -helix (A) and schematic diagram (B) of collagen triple helical coiled structure (top), organisation of coiled structure within a fibril (middle), and fibrils in a collagen fiber (bottom). [Copyright 2013 by Jones and Bartlett Learning, www.jblearning.com]

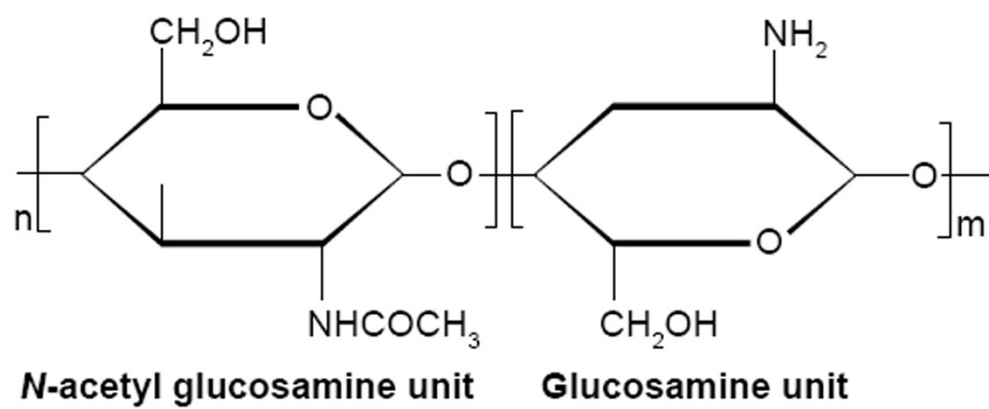


Fig. S2. Chemical structure of chitosan showing the repeating subunits.

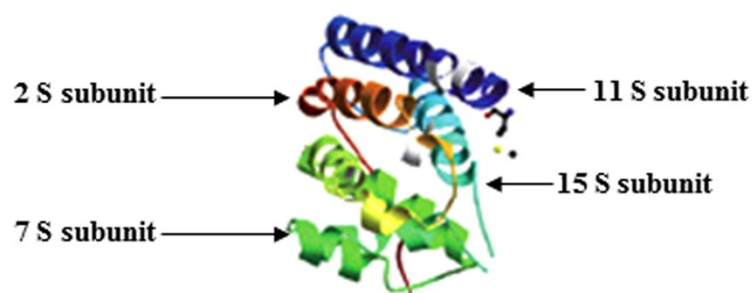


Fig. S3. Schematic diagram of soy protein isolate representing the different polypeptide subunits.

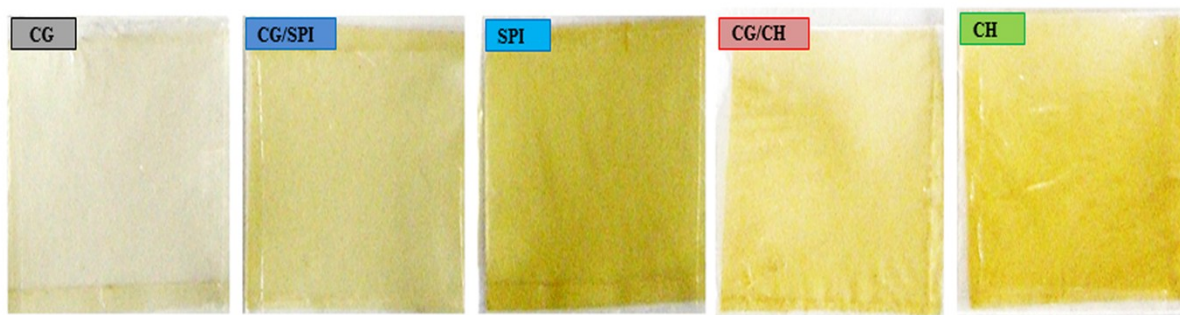


Fig. S4. Photographs of different films prepared from CG, CH, SPI, CG/CH (8:2) and CG/SPI (8:2) blend.

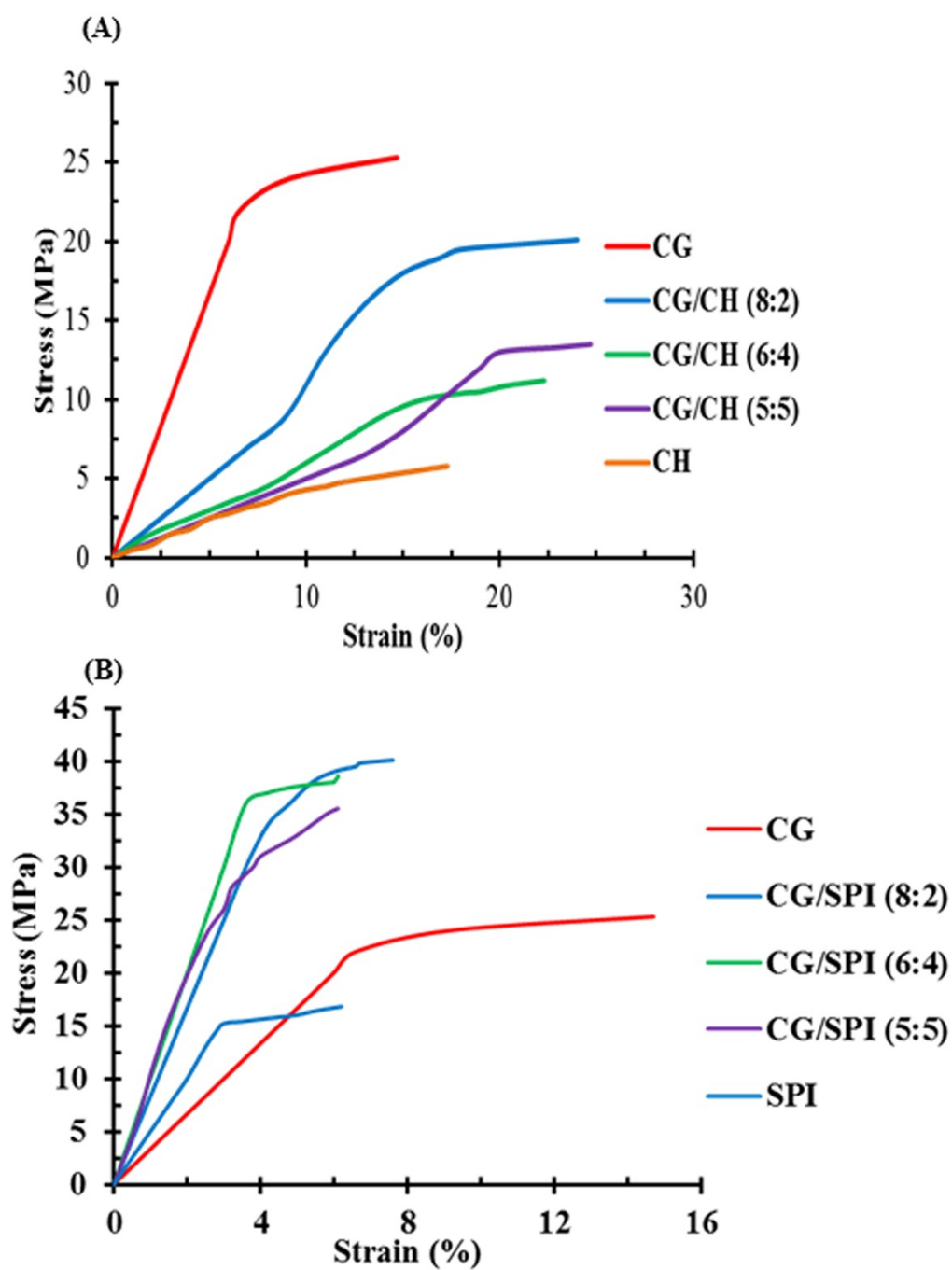


Fig. S5. Stress-Strain curves of CG/CH (A) and CG/SPI (B) composite films. Films were stabilised at $50\pm 5\%$ RH and 25 ± 0.5 °C before testing.

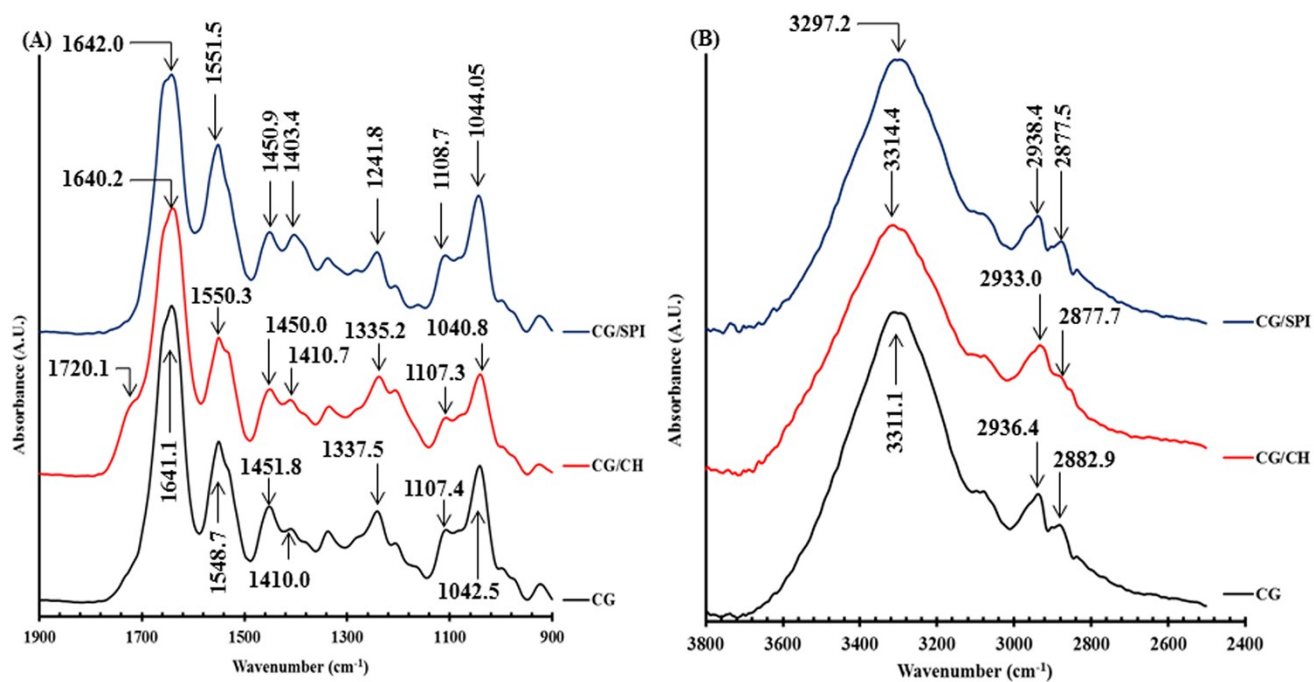


Fig. S6. Enlarged view of FTIR spectra of CG/CH and CG/SPI composite films in comparison with control CG film at the wavenumber of 1900-900 cm^{-1} (A) and 3800-2400 cm^{-1} (B).