



# Chitosan films plasticized with deep eutectic solvents (DESs): comparison between choline chloride and betaine-based DESs

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Chitosan (CH) is well known for being filmogenic and having properties such as biodegradability, non-toxicity, biocompatibility and antimicrobial activity that are desirable for both packaging and biomedical applications. Deep eutectic solvents (DESs) are eutectic mixtures that can be easily prepared by mixing hydrogen bond acceptor (HBA) and hydrogen bond donor (HBD) at determined molar ratios<sup>[1]</sup>. DESs have the potential to be used as plasticizers for CH films, improving chain mobility and enhancing their mechanical, antioxidant, and antimicrobial properties<sup>[2]</sup>. This study aims to produce and characterize chitosan films produced *via* casting with DESs as plasticizers in order to compare two species as HBAs: choline chloride and betaine. USAD (ultrasound-assisted deacetylation) process<sup>[3]</sup> was employed to produce USAD chitosan (U\_CH), which showed GA = 32%,  $M_w$  = 193 kDa and  $M_v$  = 178 kDa, while commercial chitosan (C\_CH) exhibited GA = 17%,  $M_w$  = 221 kDa and  $M_v$  = 221 kDa. The DESs were prepared by simply mixing different species of HBA (choline chloride, betaine) and HBD (glycerol, lactic acid, malonic acid) at specific molar ratios and heating at 80 °C for 1 h, resulting in homogeneous mixtures after cooling. The films were prepared by dissolving U\_CH or C\_CH in dilute acetic acid aqueous solutions followed by the addition of certain amounts of the DESs (30% and 70%, w/w to chitosan). Then, the solutions were casted in 90 mm diameter petri dishes and dried at 37 °C for 24 h in forced-air oven. Preliminary mechanical tests of the U\_CH film containing choline chloride/lactic acid DES resulted in elongation at break of 62%, tensile strength of 7.2 MPa and Young's modulus of 12.9 MPa. The next steps of the work include thermal and structural characterization of the DESs, as well as morphological analysis, swelling capacity evaluation, and degradation assessment of the films in order to compare the effects of the different DESs used as plasticizers.

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## References

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