**On the impact of rapeseed phenolic compounds on the rapeseed protein gelation**

Sybren J.M. Zondervana,b, Johannes H. Bittera, Atze Jan van der Gootb, Julia K. Kepplerb, Constantinos V. Nikiforidisa

*a Biobased Chemistry and Technology, Wageningen University & Research*

*b Food Process Engineering, Wageningen University & Research*

Rapeseed proteins are a promising alternative to animal-based proteins because they are widely produced and can be extracted from existing vegetable oil side-streams. For use in foods, it is important that these proteins can form gels to provide structure. However, co-extracted impurities, such as phenolic compounds may interfere with the protein network disrupting or enhancing it. Rapeseeds contain phenolic compounds in the form of phenolic acids in the kernel and condensed tannins in the hull. Condensed tannins are larger than the phenolic acids and have more ortho-hydroxyl groups, which were shown previously with pea proteins to lead to more interference with protein networks [1]. However, the structure of condensed tannins and phenolic acids varies per crop, which alters their reactivity. Phenolic acids of rapeseeds contain less ortho-hydroxyl groups, and the rapeseed condensed tannins are more linear than the phenolic compounds studied before. Therefore, we aim to clarify what is the impact of rapeseed condensed tannins and phenolic acids on the rapeseed protein gelation. To differentiate their impact on protein gelation, we extracted proteins from whole or dehulled seeds. Additionally, we studied model systems of isolated proteins and phenolic compounds. All mixtures were incubated at pH 7.0 or 9.0 to include oxidation reactions occurring primarily at alkaline pH.

Before gelation of the mixtures, no differences in protein aggregation were observed indicating only weak interactions of the phenolics with the proteins.

After thermal gelation of the dispersions, the protein extracts from whole seeds incubated at pH 7.0 resulted in gels with a slightly higher elastic modulus than the dehulled seed extracts. The stronger gels could be caused by co-extracted condensed tannins from the hulls. However, the gel-strengthening effect of the hull phenolic compounds was not observed in the model systems. So, co-extraction of condensed tannins with the proteins yields stronger gels than when these phenolic compounds are added to the protein extracts later in the model systems.

The incubation at pH 9.0 showed that phenolic compounds from rapeseeds can make protein networks with a slightly more elastic network when exposed to prolonged alkaline conditions.

Our findings demonstrate that rapeseed phenolic acids and condensed tannins affect the gelation of rapeseed proteins albeit faintly and differently. Therefore, dehulling or not dehulling the seeds can be an effective strategy to obtain protein extracts with finetuned functional properties.

[1] I. Faber, L. Pouvreau, A. Jan van der Goot, and J. Keppler, "Modulating commercial pea protein gel properties through the addition of phenolic compounds," *Food Hydrocolloids,* vol. 154, 2024, doi: 10.1016/j.foodhyd.2024.110123.