**Towards clean-label solutions for plant-based foods: combining commercial plant protein isolates and using enzymes to modify gel properties**

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Commercial plant protein isolates are used in various plant-based food products. However, it is a general fact that these isolates have rather limited functionality due to their harsh production process. As a result, they underperform compared to dairy proteins.

In this project, we blended commercial legume plant protein isolate (fava bean, pea) to see if there are conditions (protein concentration, ratio, pH, homogenization treatment) at which we can have a synergistic effect and thus enhanced gel properties. However, we mainly found linear or anti-synergy behaviour upon mixing, indicating that the studied proteins had only limited interactions although no phase separation at the micron scale was observed. The results and understanding of protein mixing behaviour are relevant, as one can select conditions to either promote or prevent the gelling ability of multi-protein systems.

In contrast, we found that using a crosslinking enzyme was effective in improving the gel properties (fracture stress and strain) for fava bean and pea protein gels. The impact of crosslinking was closely related to the dispersibility of the protein isolates, and therefore homogenization greatly enhanced the impact of the enzyme treatment. We also evaluated a deamidating enzyme, which increased the dispersibility of the studied protein isolates by unfolding proteins and increasing charge. Deamidation mainly improved the gelation properties of our least dispersible protein isolate (mung bean). We hypothesize that the increase in dispersibility promotes gelation. But modification of already dispersible proteins can have an adverse effect on gelation properties due to increased charge that can limit hydrophobic interactions. Research is ongoing to determine the relations between enzyme activity, protein source, dispersibility and the gelation mechanism.