

HAFL Master's Thesis Abstract

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Student's Name: Convertini Raphaël

English Title: **Elucidation of protein-polyphenol interaction in *Moringa oleifera* leaves during protein extraction using an *in-vitro* digestion model**

English Summary:

Moringa oleifera leaves are good source of proteins (30% based on dry matter) that could be an alternative to pea and soy protein in the future. But this plant also contains certain amount of polyphenols. On one hand, they provide an important antioxidant capacity that may help to reduce the risk of CVD of cancer, but on the other hand those molecules are known to interact and bind with protein. Those interactions can reduce the protein extraction yield as well as impacting their solubility, digestibility and bioaccessibility.

The aim of the present work was to better understand the interaction that occur between the proteins (BSA, Rubisco and *Moringa oleifera* leaves protein extract) and the polyphenols extracted from *Moringa* leaves (gallic acid, chlorogenic acid, isoquercetin, rutin, kaempferol and quercetin between 10 and 420mg/L depending the molecule) and what are the parameters that can limit/reduce those effects. As way to estimate the interactions, an *in-vitro* digestion system was used in order to see the impact of the polyphenols on the digestibility of the different proteins. The different tested parameters were the incubation time, the incubation temperature, the pH during incubation and the addition of sodium bisulfite as antioxidant during incubation.

In order to assess that, the OPA method was used to measure the amino acid releases during digestion and this allows to make digestion ratio between the treated and non-treated samples, to support that a polyphenol quantification was also made and the concentration after digestion was compared with the original extract concentration. Moreover, a size exclusion chromatography technic was used to determine the protein and amino acid profile but the results weren't usable.

As outcome of this study, the parameters that show the most important effect was the addition of sodium bisulfite at a concentration of 0.1%. The incubation at 4 and 40°C tend to improve the digestion, probably due to the inhibition or activity reduction of the polyphenol oxidase. Regarding the incubation time, for the plant proteins it was observable that the longer it is, the less digested the proteins are. For animal protein (BSA) the trend was the opposite. The solution pH showed no significative impact. Another general observation was that the BSA was more impacted than the two other plant based proteins (Rubisco, *Moringa* leaves protein extract) and the assumptions behind that is that the structure of the BSA is less compact and this lead to an higher reactivity, or that interactions may occur before in the plant or during extraction process which lead to less opportunity of bindings.

Keywords: Protein-polyphenol interaction, *Moringa oleifera*, *in-vitro* digestion, OPA, HPLC-DAD

Principal advisor: Daniel Heine