GreenProtein – Using all plant proteins

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Introduction

RuBisCo (ribulose -1, 5- biphosphate carboxylase oxygenase) isolation from plant material is nowadays accepted as having potential as new protein source, while the hydrophobic proteins are usually neglected, although they are present in at least the same amount as RuBisCo; in some cases (such as in algae) even in much higher amounts. This project will use one of the largest readily available sources of plant proteins in The Netherlands, which is the leaves of sugar beet plants. Isolation of hydrophobic protein together with RuBisCo from this source would in principle be sufficient to replace 39 % of our total meat consumption in The Netherlands.

Hydrophobic proteins, however, cannot be isolated in their native state because they are not soluble in water, and tend to denature during the currently used precipitation methods. Therefore, avoiding denaturation is crucial to achieve novel food applications. Hydrophobic proteins functionality has strong potential for their use in for example clinical food products and protein enriched beverages, and for structured solid protein-based products.

Aim

The aim of this project is to develop a technology for mild extraction and isolation of the hydrophobic, membrane bound proteins from sugar beet leaves and stems as representative rest stream. The protein-rich extract is targeted to be used in human food.

Research

This project will develop a mild cell disruption process to avoid common degradation processes (see process outline in figure 1). We will characterise the resulting suspension of hydrophobic proteins and dissolved RuBisCo. We will then make use of flocculation or depletion interactions to phase separate the suspended protein without denaturation. This will be the basis for a mild separation process that should preserve the nativity of the proteins. We will finally develop a method for mildly uncoupling the chlorophyll, which is bound to the hydrophobic proteins by hydrophobic interactions.

The chosen route is generic, and therefore will be applied not only to beet leaves and stems, but we will also explore the applicability to other raw materials, such as algae (in which the hydrophobic proteins are even more prominent).

Acknowledgements

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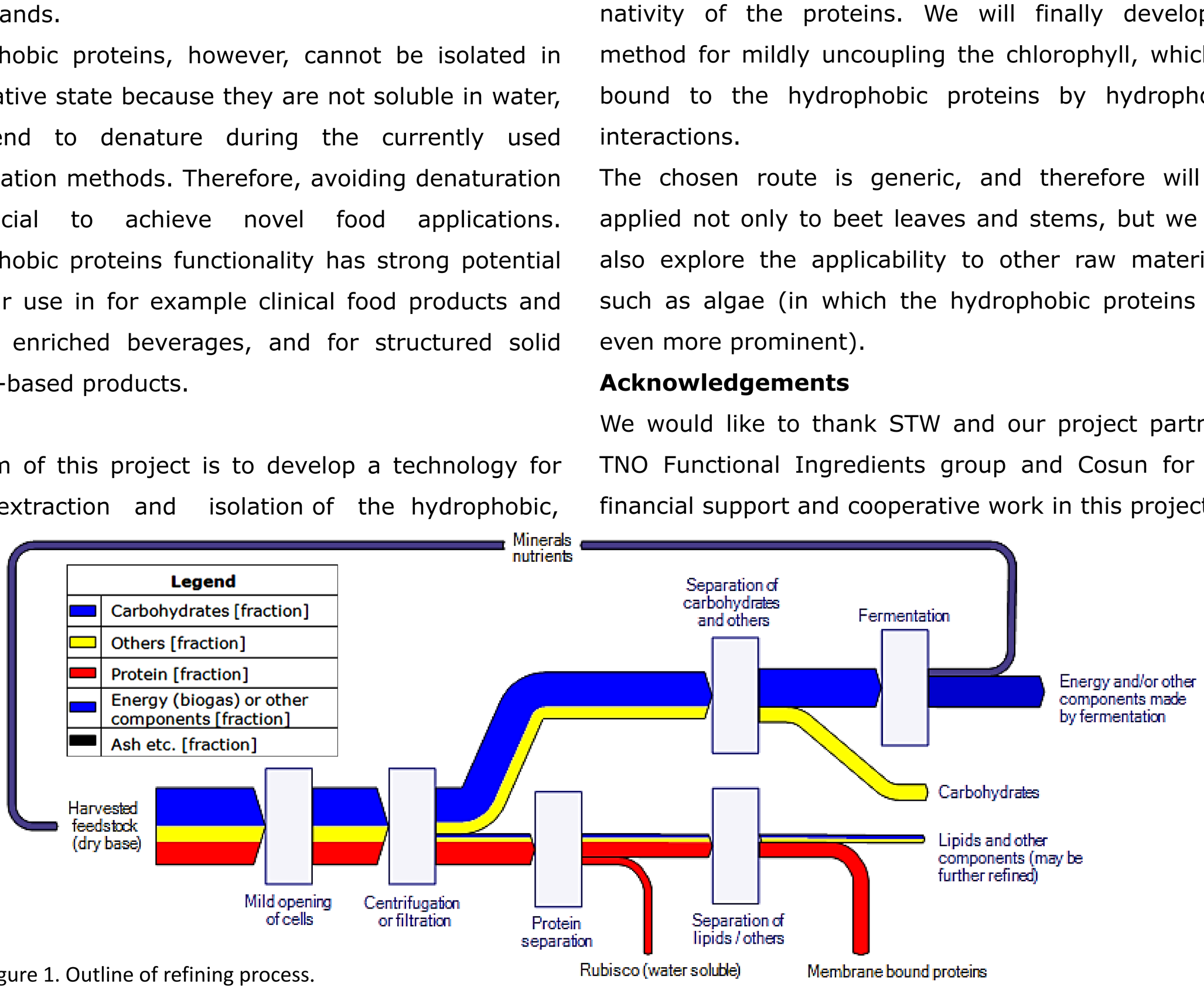

Figure 1. Outline of refining process.