# Fractionation of lupine seeds


**PhD. Student: Jacqueline Berghout**
**Thesis advisor: Remko Boom**
**Supervisor: Atze Jan van der Goot**
**Research group: FPE**
**Supported by: ISPT and The Peas Foundation**

**Phone: +31(0)317 485289**
**E-mail: jacqueline.berghout@wur.nl**
**URL: www.wageningenur.nl/fpe**
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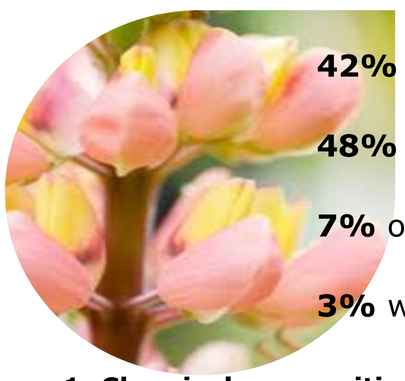
## Introduction

Animal-based diets are less sustainable than plant-based diets. To replace animal protein-based foods, attractive and nutritive alternatives are needed. Lupine seeds are very interesting for animal protein replacement. The composition of lupine seeds is given in Figure 1.



**42%** of protein

**48%** carbohydrates, soluble and insoluble

**7%** of oil

**3%** water

**Figure 1: Chemical composition of lupine seeds**

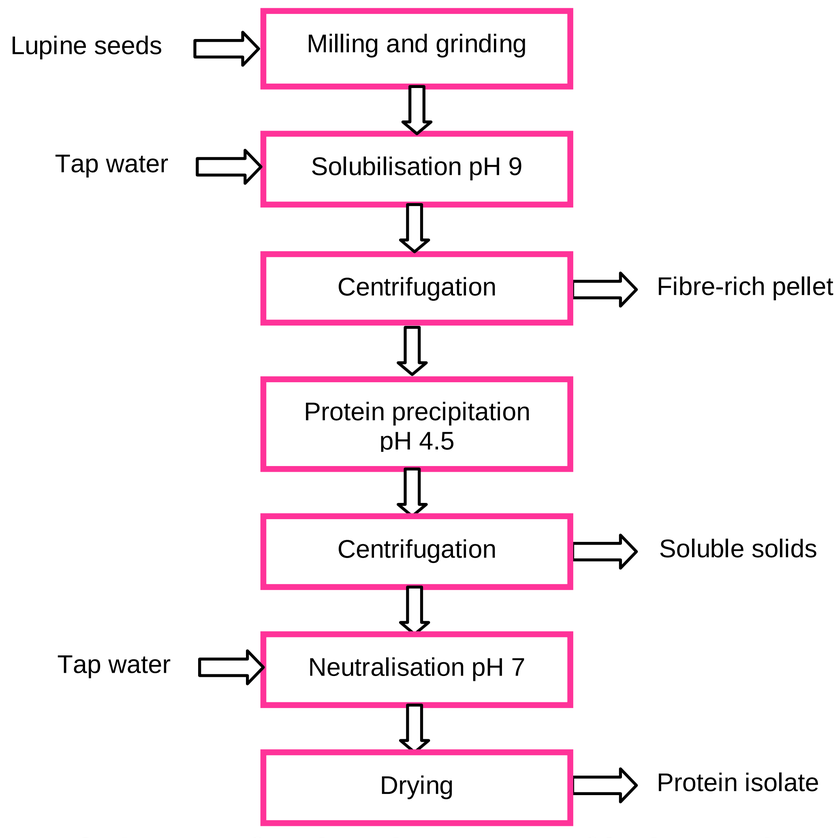



**Figure 2: Aqueous fractionation process of lupine seeds**

Since the interest lays in protein and oil, refining of the seeds is necessary to remove the carbohydrates. The conventional route is wet isolation into dry and preferably chemical pure components, but this production process requires large amounts of organic solvents, water and energy.

Moreover, most food products do not consist of one single ingredient only. Therefore, it does not seem logical to fractionate the raw material into pure components. It is better to aim for the production of functional fractions.

## Aim

This project aims for the development of an efficient process for the production of functional, protein-rich materials from lupine.

## Approach

Plant protein materials aimed at the replacement of animal-based components are allowed to contain oil. That is why we focus on aqueous fractionation (Figure 2), which omits the fat extraction step and thus the use of organic solvents. Furthermore, we investigate the functionality of the aqueous protein stream before drying and the possibility to apply this stream into products directly.

## Results

Aqueous fractionation results in protein isolates with high purity  a certain amount of oil. Conventional and aqueous fractionation processes both yielded protein isolates with similar functional properties.

To increase the sustainability of the refining process of plant seeds, the amount of water that needs to be evaporated could be reduced by using ultrafiltration. Ideally, the product would be used in products straight after ultrafiltration.

## Future work

Future research for focus on the exploration of the protein functionalities of lupine proteins for animal protein replacement, like emulsifying capacity, gelling capacity and foaming capacity. In addition, we will investigate the functionalities of the proteins that are recovered in the fibre-rich pellet and the soluble solids fraction, which accounts for approximately 40% of the protein content that was initially present in the seeds.


## Acknowledgement

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