

For the increased biorefinery value of biomass from marginal lands

Development of supercritical fluid processes for the separation of components from Andean Lupin seeds

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Introduction

Andean Lupin (*Lupinus mutabilis*, tarwi) is a plant widely grown in marginal lands for the enrichment of soil and as a food crop. Lupin beans are widely known for their high protein content and overall interesting nutritional value for human food and animal feeding. Green extraction & fractionation processes are needed to lift the biorefinery value of the seeds and enhance the relevant bio-economy. Supercritical fluid (SCF) processes will be developed for the purpose of green separation.



Lupin



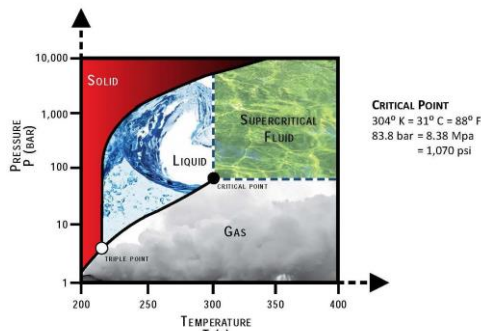
Lupin seed

Composition of Andean Lupin seeds

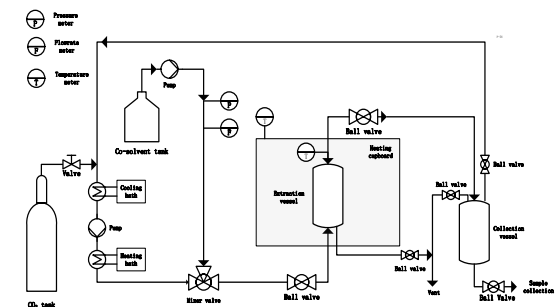
Item	Amount (w/w %)
Protein	43
Lipid	19
Carbohydrates	27
Fiber	6.3
Ash	3.7
Alkaloids	3.3

* Alkaloids are aimed to be removed to obtain debittered products.

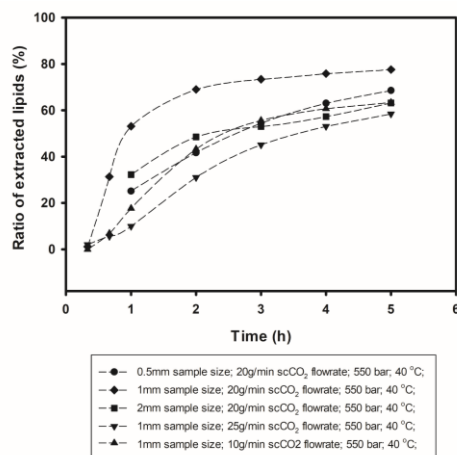
Supercritical carbon dioxide (scCO₂) is usually used for food and bioprocesses due to its near ambient critical temperature, low cost, odorlessness, colorlessness, nontoxicity, non-corrosivity and easy post-separation. Below is the phase diagram of CO₂.



scCO₂ extraction setup and P&ID diagram



Preliminary results: lipid extraction from lupin seed



* This ratio is obtained via comparing to lipid extraction via 2h soxhlet extraction using hexane.

Preliminary results: composition of extracted lipid

Lipid composition analysed via gas chromatography using the detector of mass spectrometry

	Soxhlet extraction	0.5mm size; 20g/min; 550bar; 40C;	2mm size; 20g/min; 550bar; 40C;
Fatty acid (%)			
palmitic acid methyl ester (C16:0)	10%	11%	11%
linoleic acid methyl ester (C18:2)	38%	42%	40%
oleic acid methyl ester (C18:1)	24%	27%	29%
stearic acid methyl ester (C18:0)	7%	7%	8%
arachidic acid methyl ester (C20:0)	1%	1%	1%
behenic acid methyl ester (C22:0)	1%	1%	1%

Conclusion and future work

scCO₂ technology works for the extraction of lipid from lupin seeds and a high lipid recovery can be obtained at proper operating conditions. Only slight differences on the lipid composition were found compared with conventional extraction method. The lipid composition of more samples will be analysed and the protein denaturation will be checked in the future work.

Acknowledgement

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