
Turun yliopisto
University of Turku

HOMINEM CUPIO ET AGRUM COLERE

# Chemical characterization of *Lupinus mutabilis* Sweet and *Lupinus angustifolius* seeds and oil

PROTEIN 2FOOD

Repo-Carrasco-Valencia, Ritva,

Chamorro, R, Delgado, V, Ollennu-Chuasam, P and Suomela, JP

Universidad Nacional Agraria La Molina, Perú,

University of Turku, Finland

- Bitter lupin, also known as tarwi in Peru (*Lupinus mutabilis* Sweet), is widely cultivated in the Andean region of South America.
- In Finland *Lupinus angustifolius* has been introduced recently to be used for human consumption.
- This study is part of PeruCrop project, a collaborative research between University of Turku, Finland and Universidad Nacional Agraria La Molina, Peru
- The aim of this study was to carry out the chemical characterization of seeds and oil of these two lupin species.

# Materials and methods

The tarwi, *L. mutabilis* (Andenes variety) samples originated from Cajamarca, Peru and the *L. angustifolius (Sonetia* variety*)* from Finland.


*L.*

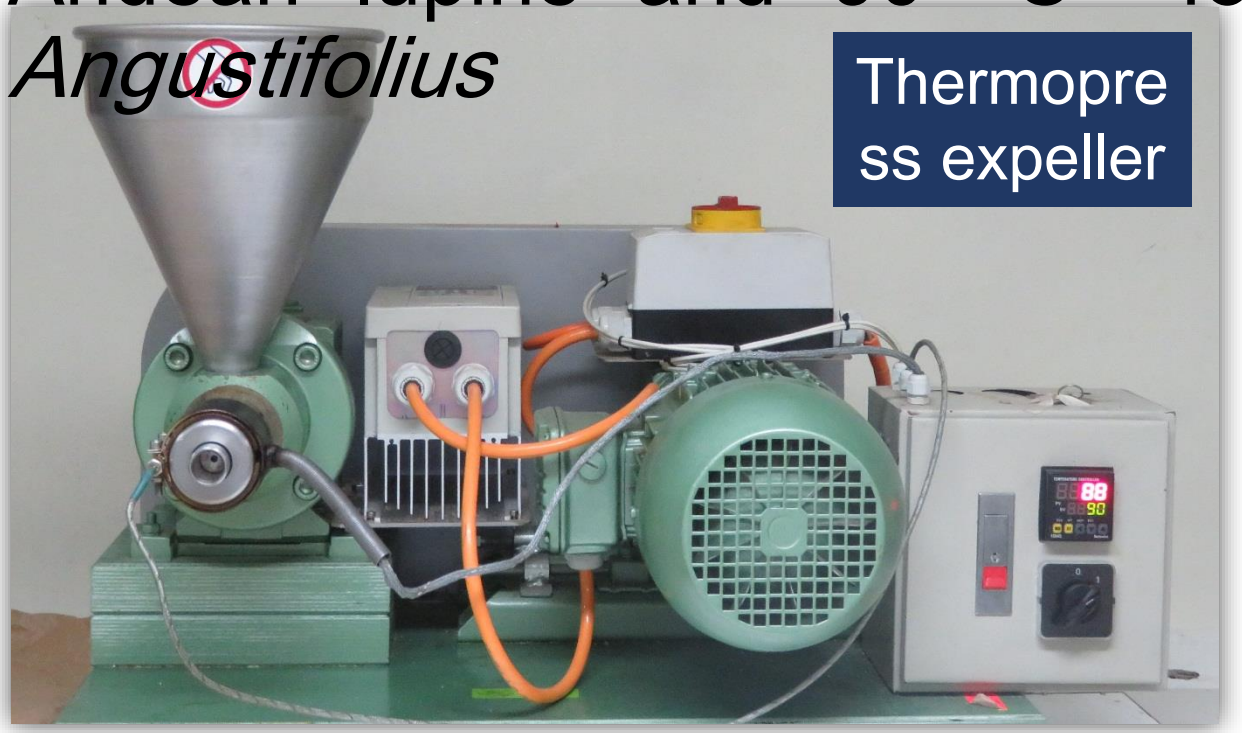
*L.*

# The following analyses in grain samples were carried out:

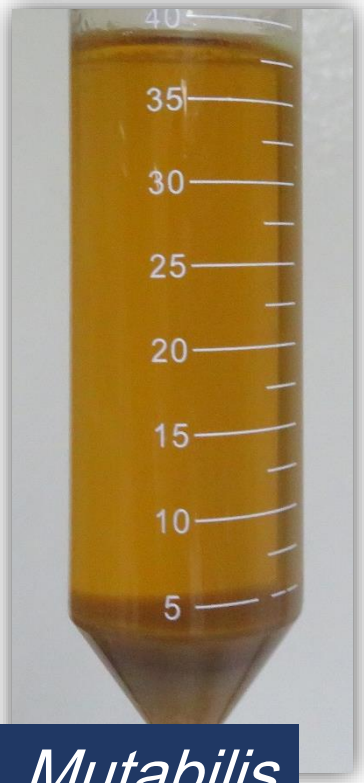
- Proximate composition
- Dietary fiber
- Total flavonoids
- Antioxidant activity
- Total phenolic compounds
- Fatty acid composition in oil

# Oil Extraction

The oil was extracted with a thermopress expeller using two temperatures (50°and 70° C) for Andean lupine and 90° C for *L. Angustifolius*



Thermopress expeller




*L. Mutabilis*

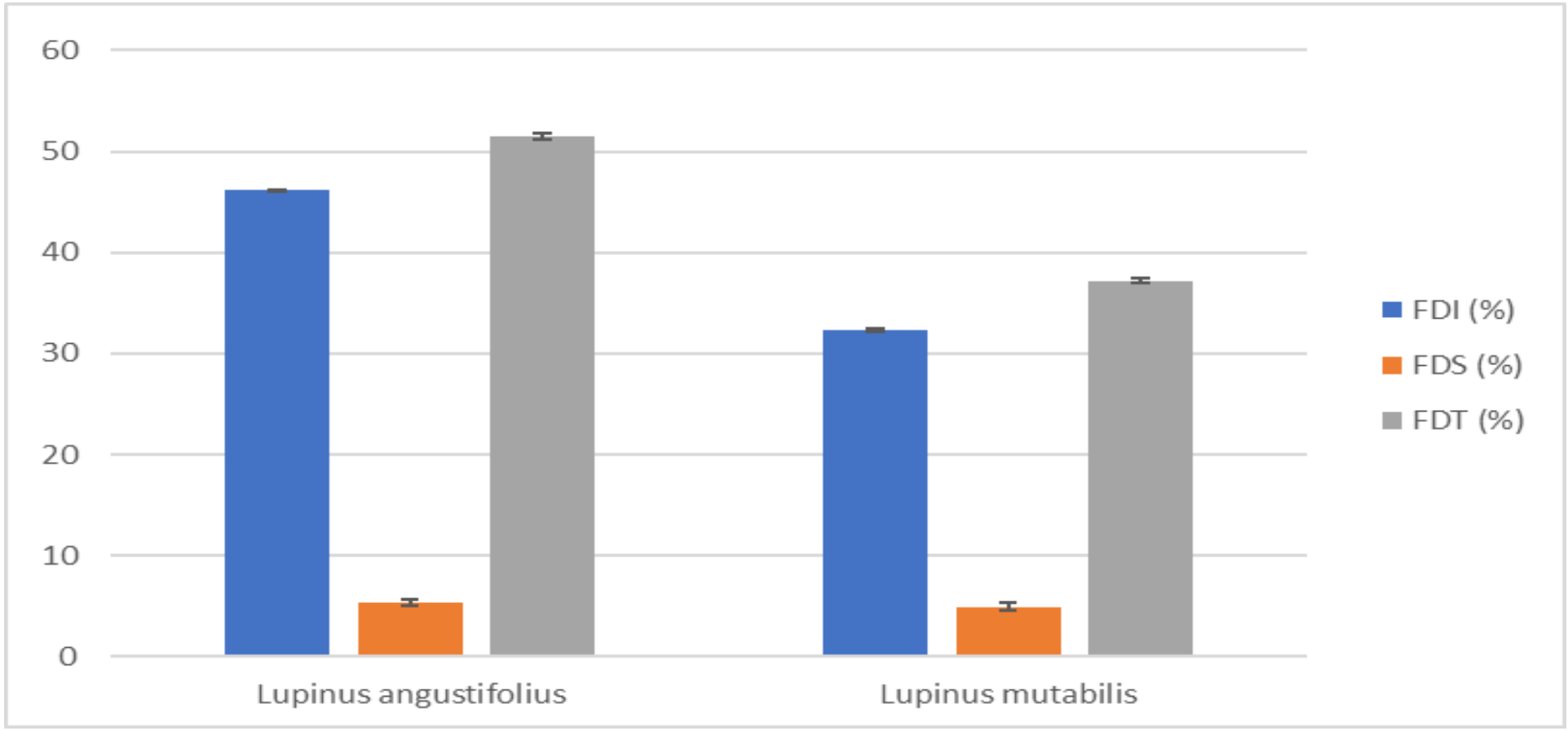
*L.*

# Results

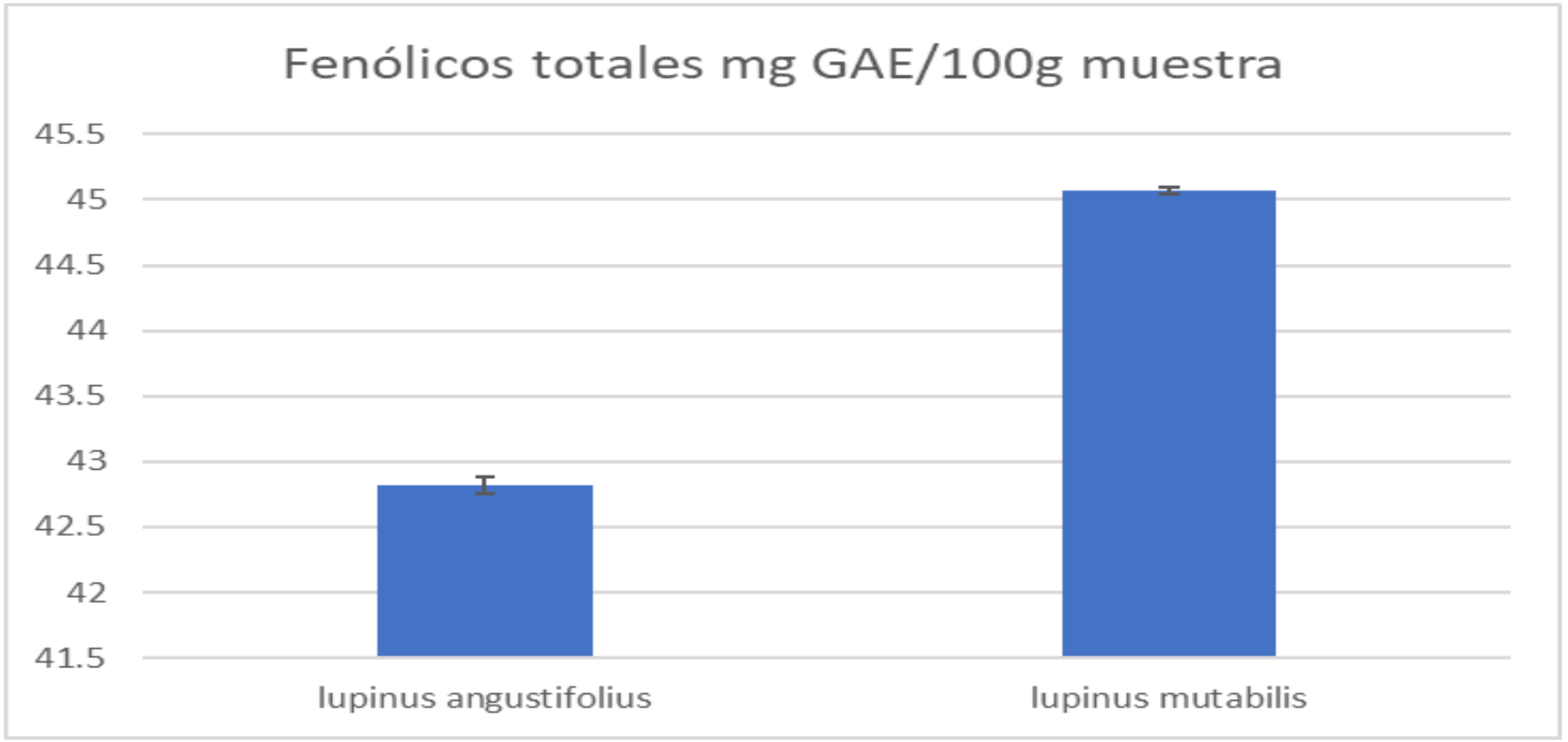
# Proximate composition of lupine seeds
# g/100 g in fresh weight

| | | | | | Carbohydrates | Energy |
|---|---|---|---|---|---|---|
| Sample | Moisture | Protein | Fat | Ash | calculated | KJ/100 g |
| Tarwi | 8.21 | 36.9 | 18.4 | 3.60 | 33.1 | 1 870 |
| Sweet lupine | 12.73 | 20.9 | 8.15 | 4.16 | 54.0 | 1 576 |

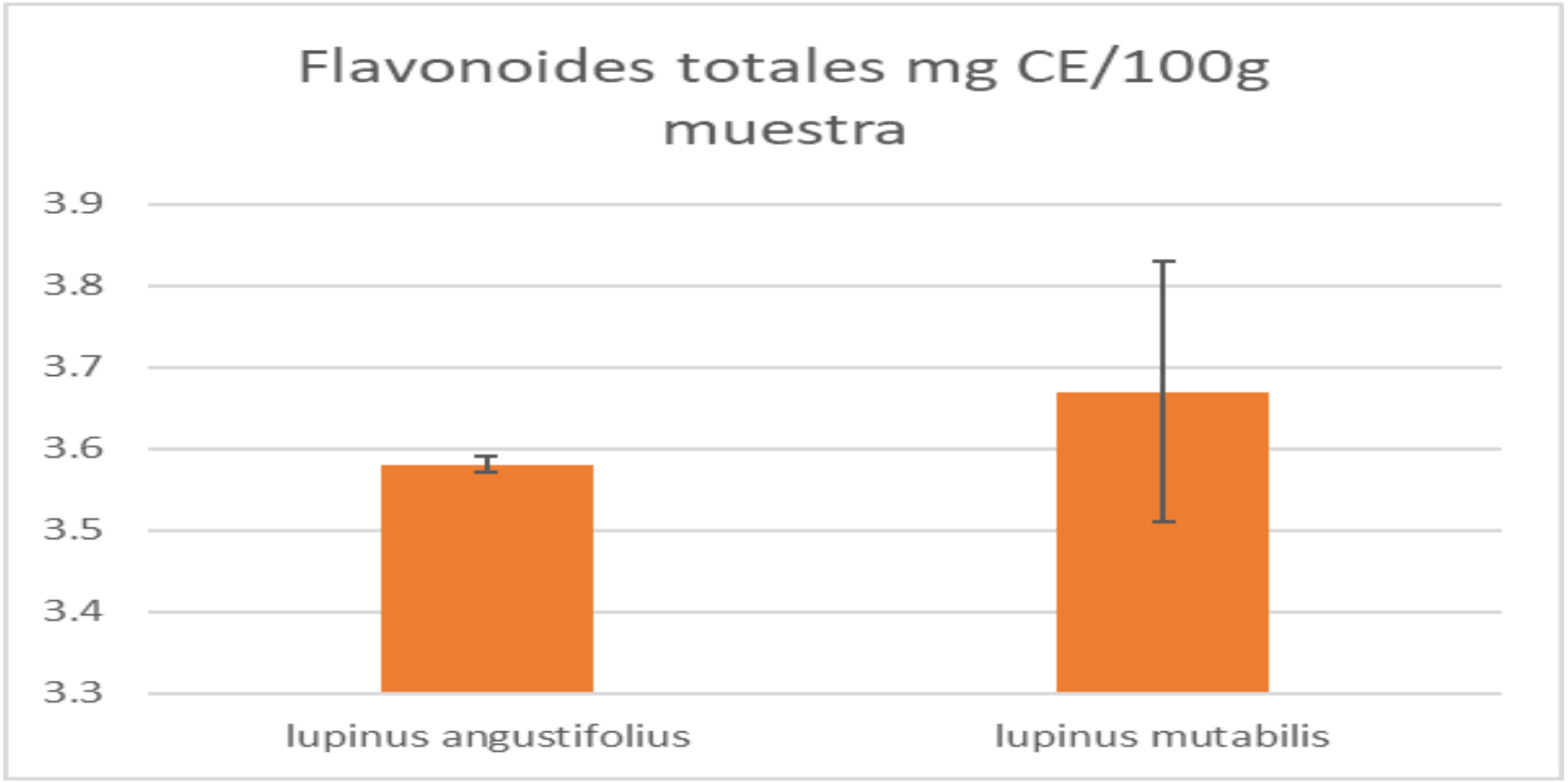
# Dietary fiber content of lupine seeds



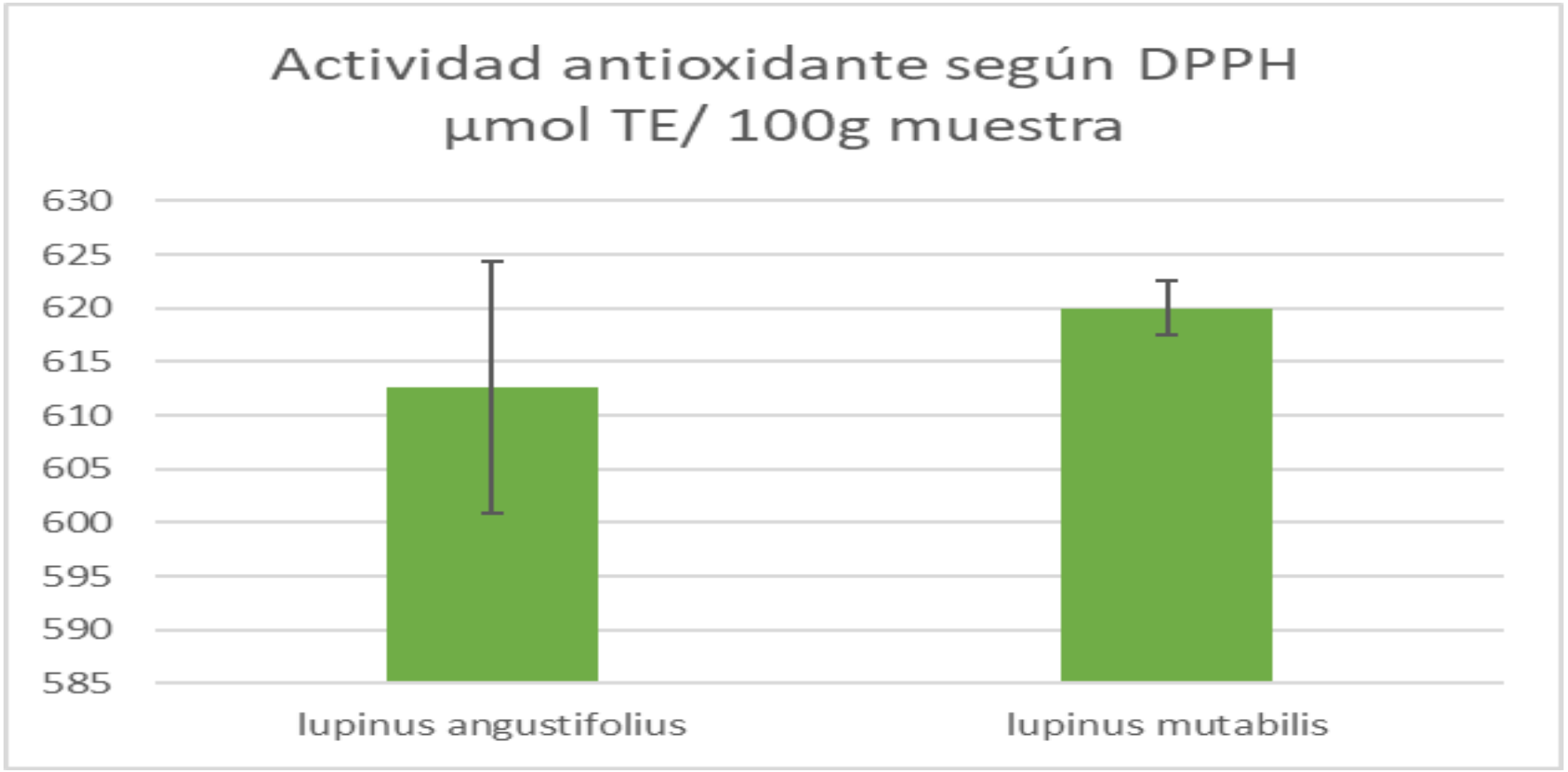
# Content of total phenolic compounds in lupine seeds



# Content of total flavonoids in lupine seeds



# Antioxidant capacity of lupine seeds



| Lupin | Fatty acids (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 16:00 | 18:00 | 18:1(n-9)c | 18:1(n-7) | 18:2(n-6)c | 18:3(n-3) | 20:00 | 22:00 |
| L. Mutabilis - 50°c | 9.60±0.16 | 9.061±0.15 | 51.71±0.46 | 0.819±0.01 | 24.23±0.41 | 2.76±0.15 | 0.93±0.01 | 0.90±0.01 |
| L. Mutabilis - 70°c | 9.92±0.20 | 9.10±0.12 | 51.21±0.86 | 0.54±0.47 | 24.52±0.44 | 2.88±0.05 | 0.93±0.01 | 0.91±0.01 |
| L. Angustifolius - 90°c | 11.03±0.11 | 7.04±0.08 | 31.57±0.06 | 0.46±0.02 | 42.36±0.09 | 4.92±0.03 | 0.89±0.01 | 1.73±0.00 |

# Conclussions

- The tarwi seeds had significally higher protein and oil content compared with *L. angustifolius*
- There were significant differences in carbohydrate and ash content, with *L. angustifolius* having a higher content of these compounds
- The total, soluble and insoluble dietary fiber content in *L. angustifolius* was significantly higher than the content of these compounds in *L. mutabilis*.
- The content of phenolic compounds, flavonoids and antioxidant activity in the two lupin species were similar

- The analysis of fatty acid composition of the lupin oils demonstrated that the oil of *L. angustifolius* has a higher content of polyunsaturated fatty acids, such as linoleic acid (omega 6) and alpha-linolenic acid (omega 3) than the oil of *L. mutabilis*.

- The temperature of extraction did not affect the content of essential fatty acids in tarwi oil

- Oleic acid content was higher in tarwi than in *L. angustifolius*.

- Both lupines are good sources of high-quality oil, with an adequate composition of essential fatty acids.

- The Wordl Health Organization recommends that the proportion of the omega 6 and omega 3 should be less than 10 :1 ⇨ *L. angustifolius*: 8.6 :1 and *L. mutabilis*: 8.5 :1

- Both species of lupins are very nutritious crops, rich in protein, dietary fiber, good quality oil and bioactive compounds.

# Acknowledgments

The authors wish to thank TEKES (Finland) for their financial support. The work undertaken in this study was part of the *PROTEIN2FOOD* project. This project has received funding from the European Union's Horizon 2020 Research and Innovation Program


# Muchas gracias!

# Thank you very much!

Contact: ritva@lamolina.edu.pe