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FTIR-ATR Characterization of By-products from Canola Oil Processing

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INTRODUCTION & AIM

Canola (also known as double-zero rapeseed) has become the third most important oilseed crop globally, both in terms of production volume and the demand for its oil. Canola oil is highly valued for its favorable lipid profile, characterized by low saturated fat content and high levels of monounsaturated and omega-3 fatty acids. Currently, the meals resulting from the processing of canola seeds are mainly used as animal feed. However, the high global production of canola oil generates considerable amounts of this by-product, which has driven research aimed at finding alternative uses for its valorization.

AIM → FTIR analysis of canola press cake and ultrasound-assisted ethanol-extracted press cake.

METHOD

Canola seeds *provided by AI High Tech (Argentina).*

Hydrothermally pretreatment in a VZ autoclave (Argentina) for **5 min at 130 °C**, dried in a BGH QuickChef microwave oven to **7% moisture** (dry basis), and pressed in an IMEGEN screw press (Argentina).

Press cake

- Ultrasound-assisted extraction (absolute ethanol, 57% amplitude, 60 min, 38°C, solid:solvent ratio 1:28, VCX 500 ultrasonic probe, USA).
- Press cake without subsequent extraction

FTIR-ATR Analysis (IRXross, Shimadzu, Japan).

RESULTS & DISCUSSION

The analysis of the spectra allowed the identification of various bands corresponding to relevant functional groups in both samples:

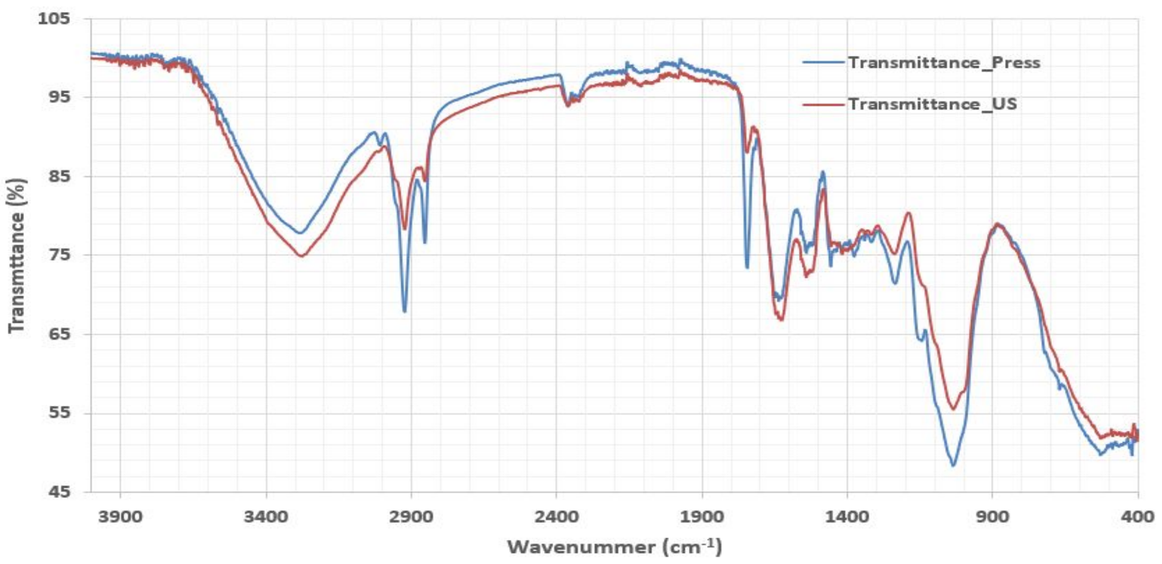

Figure 1: Transmittance versus Wavenumber (cm^{-1}) for press sample and Ultrasound (US)

Table 1. FTIR Band Assignments of Press Cake Samples

Band (cm^{-1})	Functional group / Vibration	Interpretation
1031	C–O stretching	Polysaccharides
2920–2930	C–H stretching	Polysaccharides / carbohydrate structures
1741	C=O stretching (carbonyl)	Lipids – residual oil
1230	C–H bending	Hydrocarbon chains
3003	C=CH stretching	Proteins or unsaturated compounds

CONCLUSION

In conclusion, several bands associated with different groups of biomolecules were identified, indicating that both by-products preserve key structural components of polysaccharides, lipids and proteins. This suggests the presence of elements with potential nutritional significance.

FUTURE WORK

These findings pave the way for deeper investigations focused on the fractionation and structural characterization of the extracted biomolecules, the assessment of their functional and bioactive properties, and the development of sustainable valorization strategies in technological applications. In particular, the detailed study and characterization of the present carbohydrates and fiber will be a continuation to fully understand their potential. Furthermore, optimizing the oil-extraction process will be essential to maximize yield, preserve key nutrients, and improve the overall economic and environmental performance of the workflow

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