



## Faculté Polydisciplinaire de Béni-Mellal Centre d'Études Doctorales « Sciences Pluridisciplinaires »

### Avis de soutenance d'une thèse de doctorat

Le Doyen de la Faculté Polydisciplinaire de Béni-Mellal porte à la connaissance du public que Mlle **NECHCHADI Habiba** soutiendra une thèse de Doctorat intitulée: *Phytochemical study and evaluation of the antioxidant, anti-inflammatory and hypolipidemic effects of Cynara cardunculus L. var. ferocissima leaves.*

La soutenance publique aura lieu **le samedi 13 décembre 2025 à 10h00** à l'amphi A de la Faculté Polydisciplinaire de Béni-Mellal, devant le jury composé de :

|                |   |                   |     |                                                 |
|----------------|---|-------------------|-----|-------------------------------------------------|
| 🚩 Président    | : | AIT CHAOUI Ahmad  | PES | Faculté des Sciences et Techniques, Béni-Mellal |
| 🚩 Rapporteur   | : | HARNAFI Hicham    | PES | Faculté des Sciences, Oujda.                    |
| 🚩 Rapporteur   | : | AMRANI Souliman   | PES | Faculté des Sciences, Oujda.                    |
| 🚩 Rapporteur   | : | ZAHIR Ilham       | MCH | Faculté Polydisciplinaire, Béni-Mellal.         |
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| 🚩 Directeur    | : | RAMCHOUN Mhamed   | MCH | Faculté Polydisciplinaire, Béni-Mellal.         |



## THESIS INFORMATION SHEET

- **Name of Ph.D student:** NECHCHADI Habiba, Master's degree in Biology of Human Pathology at Faculty of Science of Rabat (FSR), Mohammed V University. Bachelor's Degree in health engineering at Higher Institutes of Nursing Professions and Health Techniques of Casablanca.
- **Supervisor:** Prof. RAMCHOUN Mhamed, Biology Departement, Polydisciplinary Faculty of Beni-Mellal
- **Laboratory:**
  - ✓ Unit of Biotechnology & Sustainable Development of Natural Resources « B2DRN », Polydisciplinary Faculty of Beni-Mellal, Sultan Moulay Slimane University, Morocco.
- **Thesis period:** 2021-2025 (5 years).
- **Scientific production:**
  - **Publications**
  - 1) **Nechchadi Habiba**, Kacimi Fatima Ezzahra, McDonald Armando, Boulbaroud Samira, Berrougui Hicham, Ramchoun Mhamed (2024). Phytochemical content, antioxidant, and anti-inflammatory activities of Moroccan *Cynara cardunculus* L. var. *ferocissima* leaf methanolic extract. *Plant Foods for Human Nutrition*. <https://doi.org/10.1007/s11130-024-01234-2>
  - 2) **Nechchadi Habiba**, Nadir Youssef, Benhssaine Khalid, Alem Chakib, Sellam Khalid, Boulbaroud, Samira, Berrougui Hicham, Ramchoun Mhamed (2024). Hypolipidemic activity of phytochemical combinations: A mechanistic review of preclinical and clinical studies. *Food Chemistry*. <https://doi.org/10.1016/j.foodchem.2024.140264>
  - 3) **Nechchadi Habiba**, Benhssaine Khalid, Boulbaroud Samira, Berrougui Hicham, Ramchoun, Mhamed (2023). Factors of variation and the techniques for improving extraction and bioaccessibility of carob polyphenol: a review. *Journal of Food Measurement and Characterization*. <https://doi.org/10.1007/s11694-023-01994-6>
  - 4) **Nechchadi Habiba**, Fatima Ezzahra Kacimi, Youssef Nadir, Hicham Berrougui, Samira Boulbaroud, Mhamed Ramchoun. *Cynara cardunculus* var. *ferocissima*. L methanolic extract prevents lipidic increase and maintains the antioxidant balance in the serum and liver of

hyperlipidemic Wistar rats induced by Triton WR-1339. Applied discover science (Submitted after revision)

- 5) Kacimi, Fatima Ezzahra, Soumia Ed-Day, **Habiba Nechchadi**, Laila Ibouzine-Dine, Ramchoun Mhamed, Hicham Berrougui, Fatima-Zahra Azzaoui, Samira Boulbaroud (2025). The Impact of Vitamin A Deficiency and Supplementation on Behavioral and Oxidative Stress Markers in Male Offspring of a Valproic Acid-Induced Autism Rat Model. *Developmental Neurobiology*. <https://doi.org/10.1002/dneu.22990>
- 6) Kacimi Fatima Ezzahra, Esselmani Hicham, Ed-Day Soumia, **Nechchadi Habiba**, Mohamed Merzouki, Mhamed Ramchoun, Fatima-Zahra Azzaoui, Samira Boulbaroud (2025). Vitamin A supplementation restores neuroanatomical integrity and behavior in a valproic acid-induced autism model. *Journal of Molecular Histology*. <https://doi.org/10.1007/s10735-025-10553-w>
- 7) Khalid Benhssaine, Jamal Aabdousse, Nawfel el Bouchti, **Habiba Nechchadi**, Abderrahim Ettaqy, Mhamed Ramchoun, Younes Abbas, Hicham Berrougui. Anthropogenic Activities and Climate Variability Impacts on Juniperus thurifera Forest of El Houanet, Morocco. *Ecological Engineering & Environmental Technology*. <https://doi.org/10.12912/27197050/178278>.

#### - Oral communications

- 1) **NECHCHADI Habiba**, NADIR Youssef, KACIMI Fatima Ezzahra, BOULBAROUD Samira, RAMCHOUN Mhamed (2025). *Cynara ferocissima* leaves supplemented in the diet modulate biochemical, hematological, and neurobehavioral disorders in rats fed a high-fat sucrose diet. Annual International Congress on Food Science & Nutrition Oxford, United Kingdom, August 21-22, 2025
- 2) **NECHCHADI Habiba**, KACIMI Fatima Ezzahra., MCDONALD Armanndo, BOULBAROUD Samira, BERROUGUI Hicham, RAMCHOUN Mhamed (2024). Phytochemical content, antioxidant, and anti-inflammatory activities of Moroccan *Cynara cardunculus* L. var. *ferocissima* leaf methanolic extract. Third International Symposium on the Valorization of Aromatic and Medicinal Plants (VAMP'25), Tetouan Higher Normal School, Abdelmalek Essaâdi University, Morocco, April 19 to 21, 2025



## **ABSTRACT**

Hyperlipidemia is a major risk factor for kidney disease, non-alcoholic fatty liver disease, and atherosclerosis. This study investigated, for the first time, the phytochemical composition, antioxidant, anti-inflammatory, and hypolipidemic effects of the methanolic extract and whole leaves of *Cynara cardunculus* L. var. *ferocissima* in two models of hyperlipidemia induced in Wistar rats: by intraperitoneal injection of Triton WR-1339 and by ingestion of a high-fat, high-sucrose diet. The methanolic extract was rich in total polyphenols, hydroxycinnamic acids, flavonols, ortho-diphenols, and terpenoids, and exhibited pronounced DPPH radical-scavenging activity ( $IC_{50} = 0.248 \pm 0.008$  mg/mL) and ferric-reducing power ( $104.01 \pm 0.429$  mg AAE/g extract). The extract also demonstrated potent anti-inflammatory activity by inhibiting protein denaturation ( $IC_{50} = 0.390 \pm 0.004$  mg/mL) and heat-induced hemolysis ( $IC_{50} = 2.39 \pm 0.413$  mg/mL). Furthermore, the methanolic extract reduced total cholesterol by 59.8%, triglycerides by 89.2%, and total lipids by 76.6%, while significantly increasing HDL-C levels. It restored redox homeostasis by decreasing plasma malondialdehyde and enhancing the antioxidant activity while protecting kidney tissue and reducing lipid accumulation and oxidative stress in the liver. Moreover, incorporating 8% *Cynara ferocissima* leaf into the high-fat, high-sucrose diet effectively decreases total cholesterol by 14.3%, triglycerides by 60.7%, total lipids by 45.5%, phospholipids by 18.7%, and VLDL-C by 60.6%, while improving hematological and neurobehavioral parameters. These results confirm the therapeutic potential of *Cynara cardunculus* L. var. *ferocissima* leaves as a natural source of bioactive compounds that can effectively and safely prevent hyperlipidemia and its associated complications.

**Keywords:** *Cynara cardunculus* L. var. *ferocissima*, antioxidant, anti-inflammatory, hyperlipidemia, lipoprotein oxidation, hepatoprotective, neuroprotective, kidney, tyloxapol, high-fat-high-sucrose diet.