

## Phytochemical Profiling, Antioxidant Activity, and Toxicological Assessment of *Abies marocana* Trab. Woody Biomass: Pharmacognostic Evaluation of an Endemic Moroccan Species

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### INTRODUCTION & AIM

Morocco's rich flora harbors a remarkable diversity of endemic species with promising pharmacological and biotechnological potential. Among them, *Abies marocana* Trab., a conifer species native to the Rif Mountains, remains largely underexplored despite its ecological and traditional significance. Previous studies on related *Abies* species have demonstrated notable antioxidant and therapeutic properties, suggesting that *A. marocana* may also represent a valuable natural resource [1].

This study aims to investigate the **phytochemical composition, antioxidant potential, and acute oral toxicity** of the woody biomass (twigs and cones) of *A. marocana* Trab., thereby contributing to the scientific understanding and valorization of this endemic Moroccan species.

### METHOD

To comprehensively evaluate the pharmacognostic potential of *Abies marocana* Trab. woody biomass, the study encompassed **nutritional, phytochemical, chemical, and biological analyses** [1].

#### Sample Preparation and Extraction

- **Collection:** Twigs and cones of *Abies marocana* Trab. were collected from the Rif Mountains, Morocco.
- **Preparation:** Samples were washed, air-dried, and ground into fine powder.
- **Delipidation:** Powdered samples were first defatted using **petroleum ether** to remove lipids.
- **Extraction:** The defatted material was then extracted with **methanol** using a **Soxhlet apparatus** to obtain bioactive compounds for further analyses.

#### Nutritional Composition

- **Proximate Analysis:** Moisture, ash, fiber, protein, carbohydrate, and lipid contents were determined according to **AOAC (2016)** standard protocols.
- **Mineral Composition:** Essential minerals were quantified using **Inductively Coupled Plasma–Optical Emission Spectrometry (ICP–OES)**.

#### Phytochemical Characterization

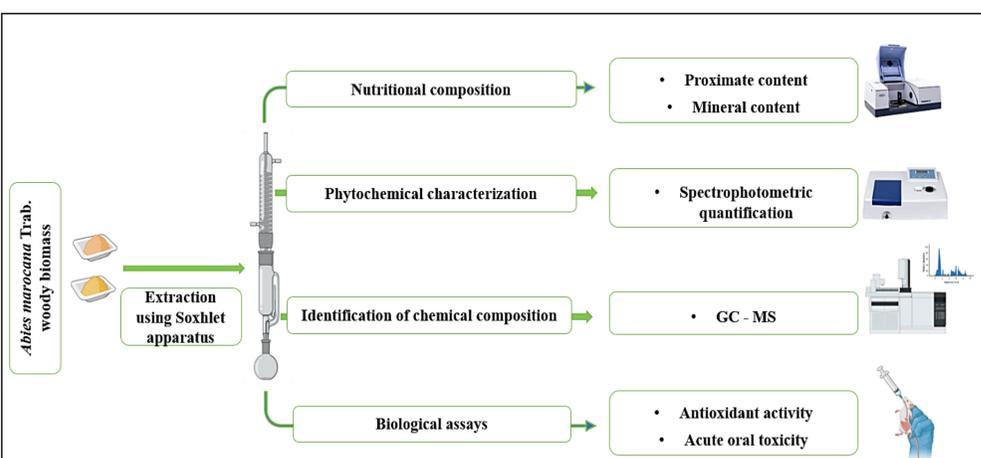
- **Spectrophotometric Quantification:** Total phenolics, flavonoids, tannins, and phytosterols were assessed in methanolic extracts using validated spectrophotometric methods.

#### Chemical Composition

- **Volatile Compounds:** The chemical profile of volatile constituents was determined by **Gas Chromatography–Mass Spectrometry (GC–MS)**.

#### Biological Assays

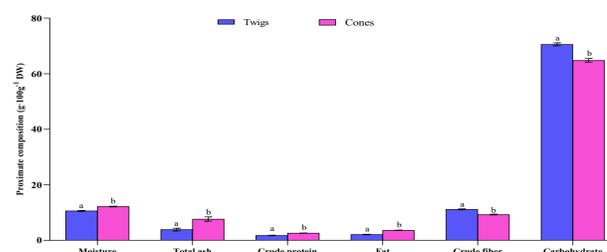
- **Antioxidant Activity:** Free radical scavenging potential was evaluated via the **DPPH assay**, and  $IC_{50}$  values were calculated.
- **Acute Oral Toxicity:** Conducted in Wistar rats according to **OECD guideline 423**, with doses up to  $1000 \text{ mg}\cdot\text{kg}^{-1}$ , monitoring behavioral and physiological responses.



### RESULTS & DISCUSSION

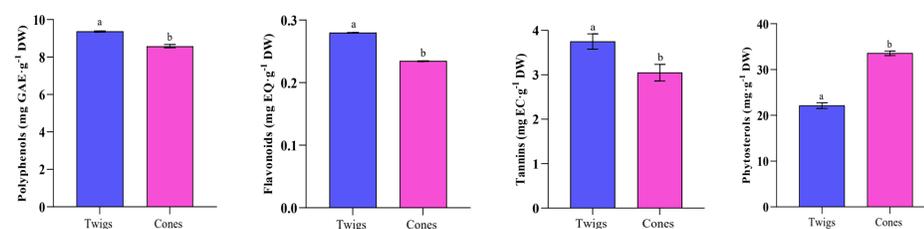
#### Nutritional Composition

Twigs and cones contained appreciable amounts of **protein, fiber, carbohydrates, and lipids**, along with essential minerals (Ca, K, Mg, Fe), highlighting their nutritional and functional potential.



#### Phytochemical Profile

Methanolic extracts were rich in **phenolics, flavonoids, tannins, and phytosterols**, indicating strong bioactive potential. These compounds likely contribute to the observed antioxidant activity.

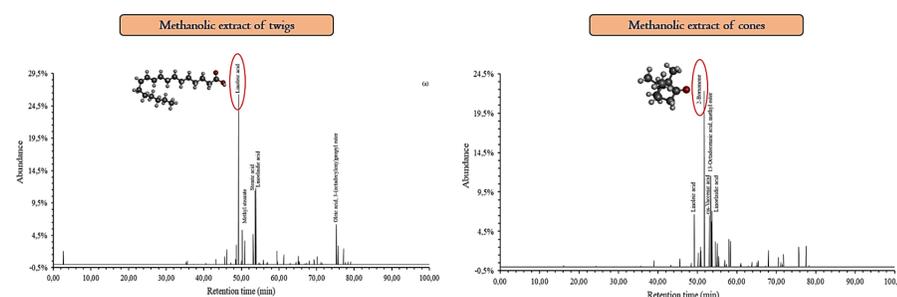


#### Antioxidant Activity

Extracts demonstrated **high DPPH radical scavenging capacity**, confirming the functional relevance of the identified phytochemicals.

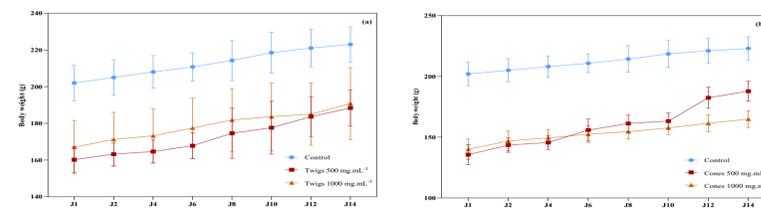
#### Volatile Compounds

GC–MS revealed **linoleic acid** as the main compound in twigs and **2-Bornanone** in cones, supporting their bioactive and therapeutic properties.



#### Acute Oral Toxicity

No mortality or behavioral changes occurred at doses up to  $1000 \text{ mg}\cdot\text{kg}^{-1}$ , suggesting a **favorable safety profile** for potential applications.



### CONCLUSION

The study demonstrates that *Abies marocana* woody biomass possesses a valuable nutritional and phytochemical profile. Its pronounced antioxidant potential and non-toxic nature confirm its biological safety. These findings underscore its promising applicability in nutraceutical, pharmaceutical, and cosmeceutical formulations.

### REFERENCES

- [1] Zirari, Malak, et al. "In-depth Study of the Nutritional Composition, Phytochemicals, Antioxidant Activity, Molecular Docking Interactions, and Toxicological Evaluation of *Abies marocana* Trab. Woody Biomass." *Frontiers in Sustainable Food Systems*, 8 (2025): 1525572