

Alex-Robert Jijie ^{1,2}, Elena-Alina Moacă ^{1,2}, Oana Andrada Iftode ^{1,2}, Dalia Pătrașcu ^{1,2}, George Andrei Drăghici ^{1,2}, Cristina Adriana Dehelean ^{1,2}

¹ University Clinic of Toxicology, Drug Industry, Management and Legislation, Faculty of Pharmacy, "Victor Babes" University of Medicine and Pharmacy Timisoara, 2nd Eftimie Murgu Square, 300041 Timisoara, Romania
² Research Centre for Pharmacotoxicological Evaluation, Faculty of Pharmacy, "Victor Babes" University of Medicine and Pharmacy, 2nd Eftimie Murgu Square, 300041 Timisoara, Romania
✉ Email: alex-robert.jijie@umft.ro

BACKGROUND

Taxus baccata L. (European yew) is a gymnosperm species well known for its anticancer taxane content, but also for its systemic toxicity caused by taxine alkaloids A and B, present in all parts of the plant except the red aril, a fleshy structure that surrounds the seed. Although generally considered edible, the aril has attracted growing scientific interest due to its complex biochemical profile, which includes rare carotenoids (rhodoxanthin), polyphenols, unusual fatty acids (PMI-FAs), and essential amino acids. Recent literature suggests that the aril may function as an **ecological phytosentinel**, capable of *accumulating heavy metals* depending on soil composition. Aril extracts exhibit antioxidant and anticancer potential, positioning this structure between pharmacological value and toxicological concern. Its sensitivity to environmental metal exposure also supports its role as a natural bioindicator for pollution assessment [1,2].

- ✓ This study aims to chemically, histologically, and toxicologically characterize the red aril of *Taxus baccata* L., in order to assess its therapeutic potential as well as the ecological and consumption-related risks it may pose.
- ✓ Specific objectives:
 - To determine the elemental composition of the aril using X-ray fluorescence (XRF) spectroscopy, in order to detect potential heavy metal accumulation;
 - To perform histochemical visualization of alkaloid presence/absence in aril and seed tissues using sulfuric vanillin staining;
 - To assess the biosafety of an ethanolic aril extract (TX_A) through the HET-CAM (Hen's Egg Test on Chorioallantoic Membrane) assay;
 - To determine the antioxidant capacity of the ethanolic extract using the DPPH radical scavenging method;
 - To estimate the total polyphenol content of the aril extract using the Folin–Ciocâlteu reagent.

AIM & OBJECTIVES

RESULTS & DISCUSSIONS

- ✓ **Histochemical staining (Fig. 1):** Sulfuric vanillin is a histochemical reagent specific for alkaloids and terpenoid compounds, selectively indicating their accumulation sites. The microscopic preparation stained with 1% sulfuric vanillin showed a strong positive reaction in the seed portion (intense red) and a negative reaction in the aril, confirming the absence of toxic diterpenic alkaloids in the aril.

Fig. 1. Cross section through the aril of *Taxus baccata* L., including a fragment of the seed

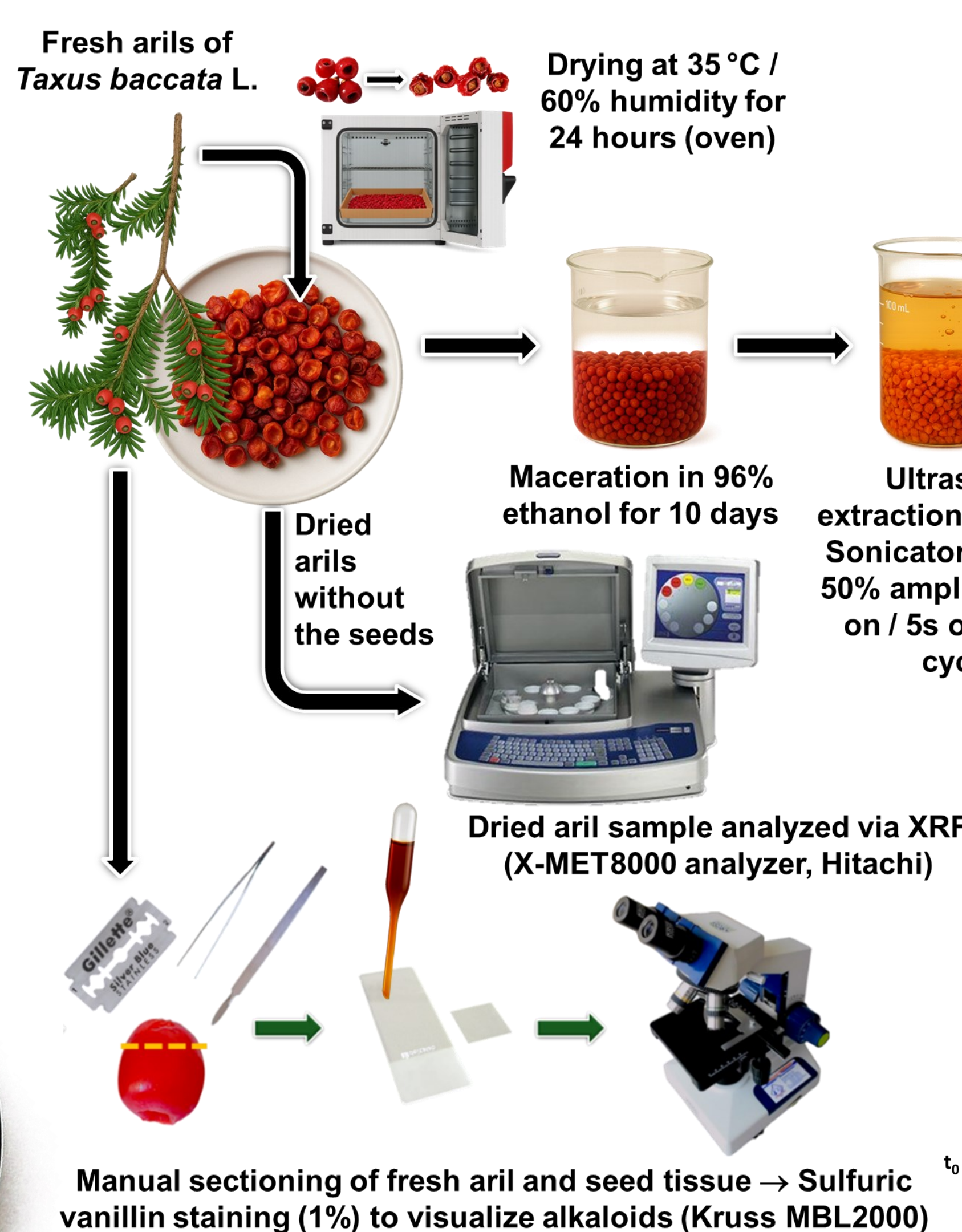


Table 1. HET-CAM: comparative analysis of irritability scores

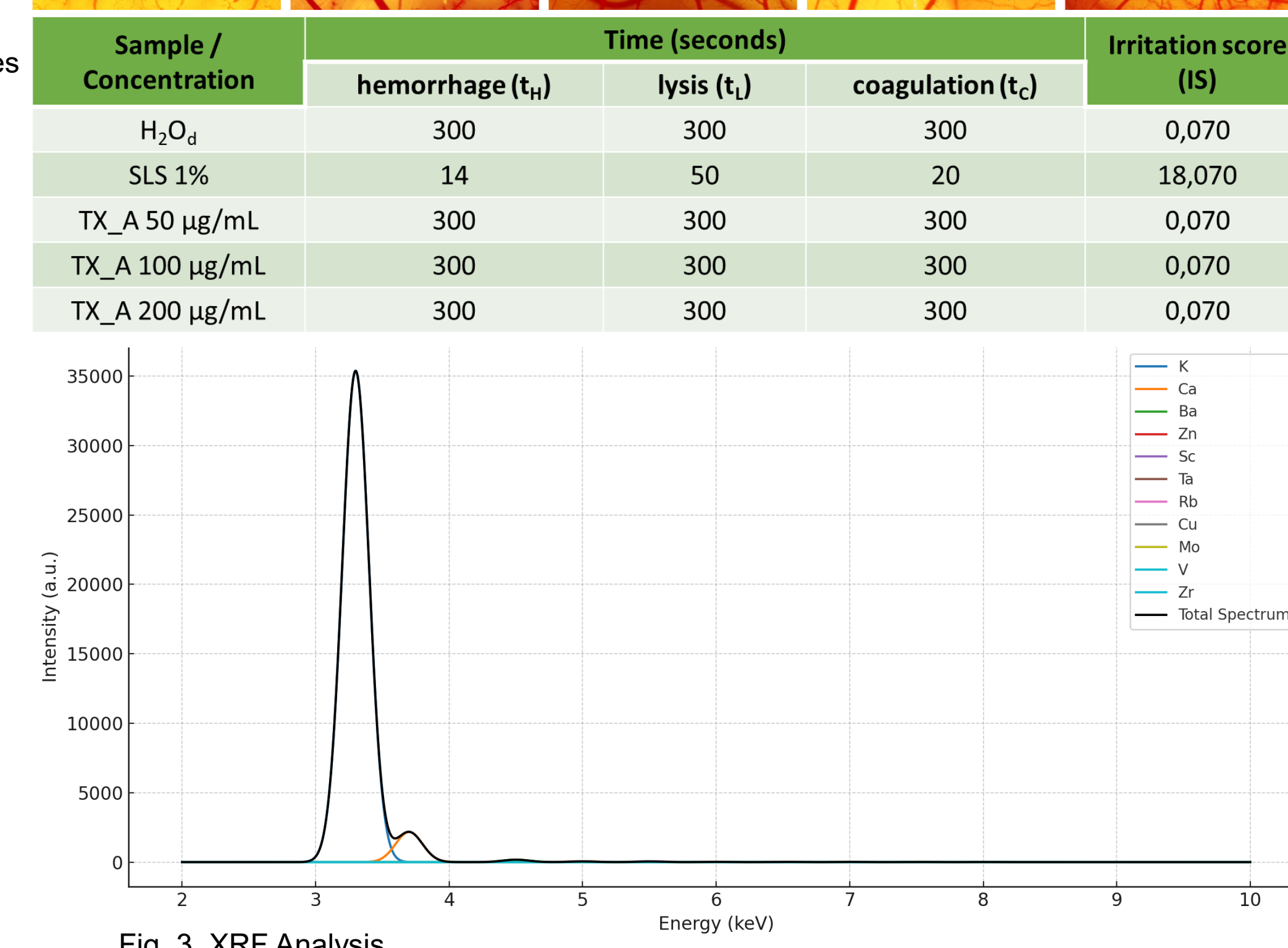
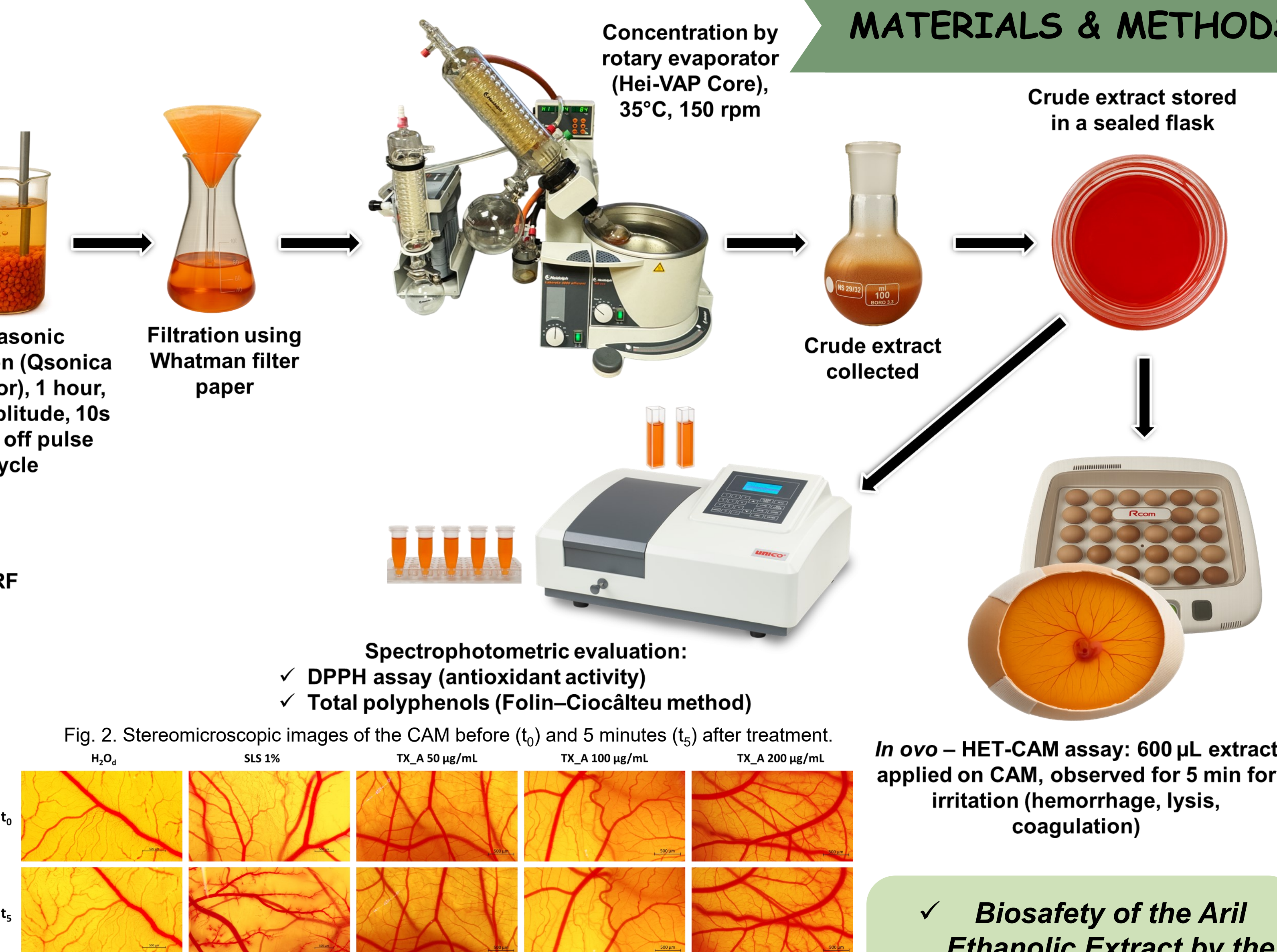


Fig. 3. XRF Analysis

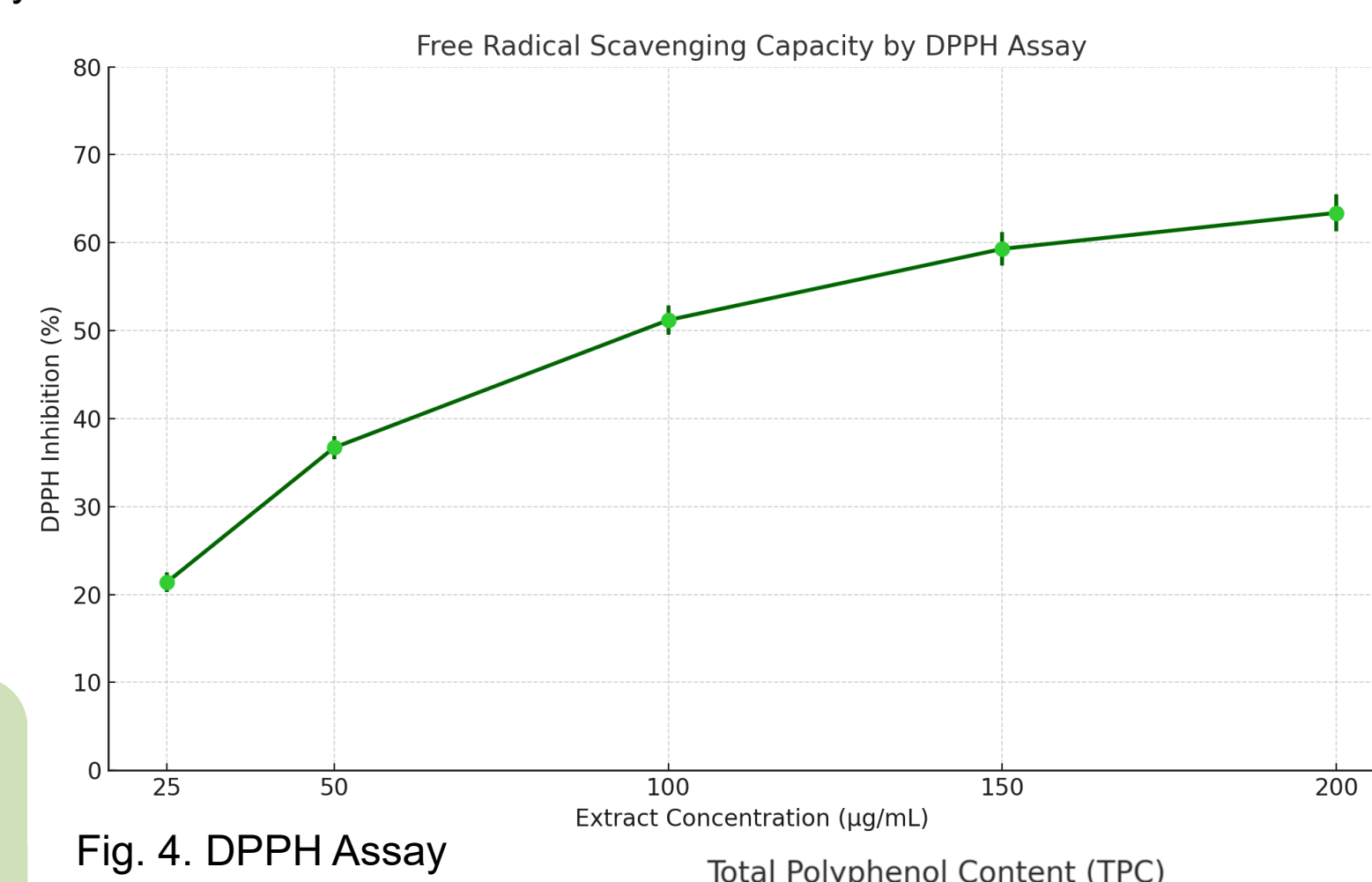


Fig. 4. DPPH Assay

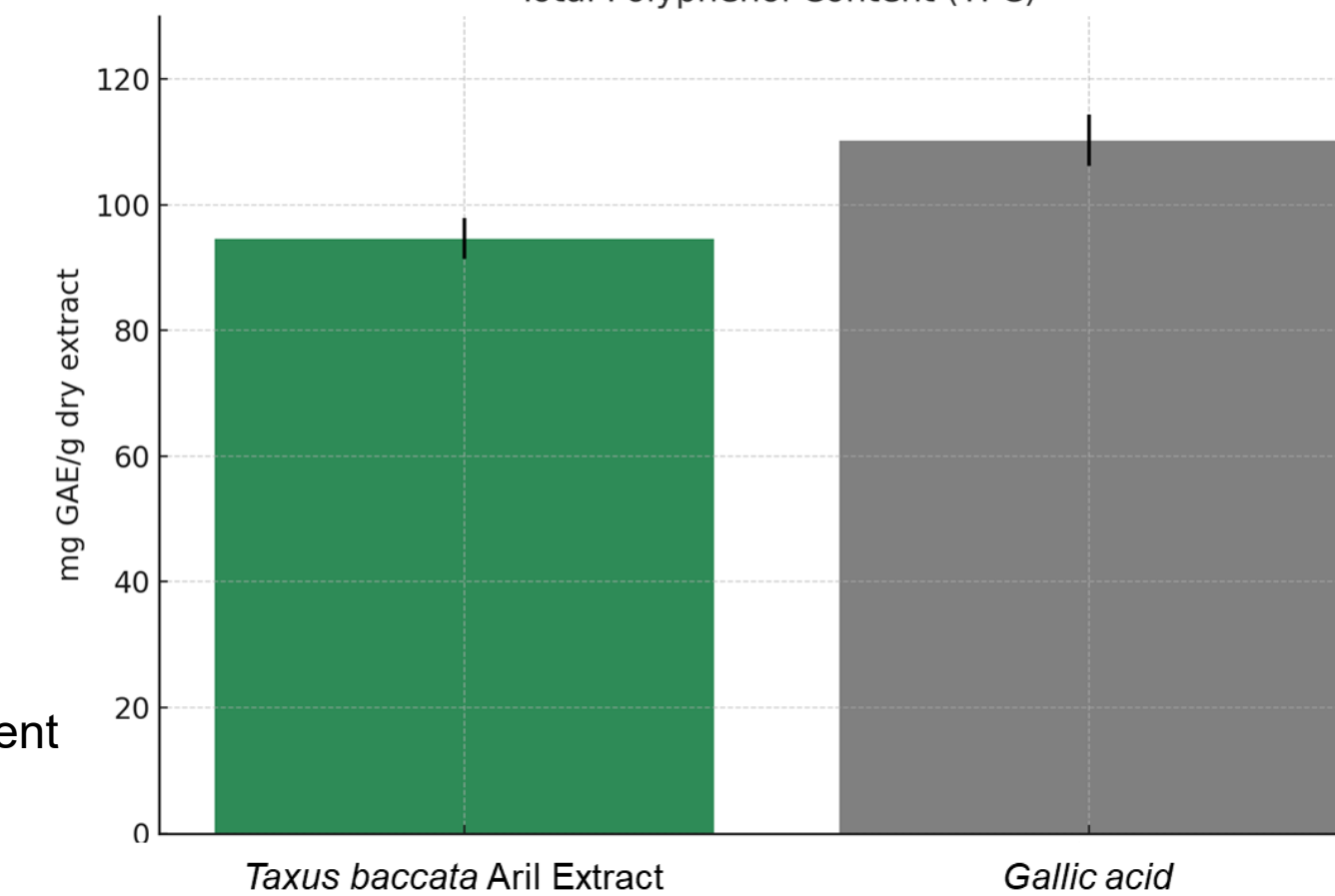


Fig. 5. TPC Content

MATERIALS & METHODS

In ovo – HET-CAM assay: 600 µL extract applied on CAM, observed for 5 min for irritation (hemorrhage, lysis, coagulation)

- ✓ **Biosafety of the Aril Ethanolic Extract by the HET-CAM Assay (Fig. 2):** The aril ethanolic extract was tested using the HET-CAM assay at 3 concentrations (50, 100, 200 µg/mL), and compared with negative control (H₂O₄) and positive control (SLS 1%). No hemorrhage, lysis, or coagulation was observed. Irritation scores were similar to the negative control (IS = 0.07), indicating no irritant effect and a favorable biosafety profile.

Table 2. XRF Analysis

Element:	Average ppm
Potassium (K)	35383
Calcium (Ca)	2173
Barium (Ba)	175
Zinc (Zn)	54
Scandium (Sc)	51
Tantalum (Ta)	21
Rubidium (Rb)	20
Copper (Cu)	17
Molybdenum (Mo)	13
Vanadium (V)	9
Zirconium (Zr)	5
Mercury (Hg)	4
Iron (Fe)	ND
Antimony (Sb)	ND
Nickel (Ni)	ND
Gold (Au)	ND
Thorium (Th)	ND
Lead (Pb)	ND
Cadmium (Cd)	ND
Uranium (U)	ND
Thallium (Tl)	ND

CONCLUSIONS

- ✓ This study demonstrated that the aril of *Taxus baccata* L. is free of toxic diterpenic alkaloids (negative reaction to sulfuric vanillin) and shows no irritant potential *in ovo* (IS = 0.07).
- ✓ XRF analysis confirmed the absence of toxic heavy metals (Cd, Pb, Hg, Ni), indicating a safe ecotoxicological profile.
- ✓ The ethanolic extract exhibited significant antioxidant activity (63.4% DPPH inhibition at 200 µg/mL, IC₅₀ = 112.5 µg/mL) and a high polyphenolic content (94.6 mg GAE/g).
- ✓ The aril can be considered a promising source of bioactive compounds and a potential environmental bioindicator.

ACKNOWLEDGEMENT

This work was supported by the Doctoral School of "Victor Babes" University of Medicine and Pharmacy of Timisoara and by a grant from the Ministry of Research, Innovation and Digitization, CNCS-UEFISCDI, project number PN-IV-P2-2.1-TE-2023-1941, within PNCDI IV.

1. Tabaszewska M, Rutkowska J, Skoczylas L, Słupski J, Antoniewska A, Smoleń S, et al. Red Arils of *Taxus baccata* L.-A New Source of Valuable Fatty Acids and Nutrients. *Molecules*. 2021 Jan 30;26(3):723.
2. Tabaszewska M, Antoniewska A, Rutkowska J, Skoczylas L, Słupski J, Skoczeń-Słupska R. Bioactive Components, Volatile Profile and In Vitro Antioxidative Properties of *Taxus baccata* L. Red Arils. *Molecules*. 2021 Jul 24;26(15):4474.