

An experimental animal study of burn healing activities of *Urtica dioica* ethanolic extract

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Introduction

Burns are traumatic pathologies responsible for significant morbidity and mortality [1]. It is a public health problem, particularly due to their frequency, potential severity, the after-effects they can generate as well as their treatment and prevention [2].

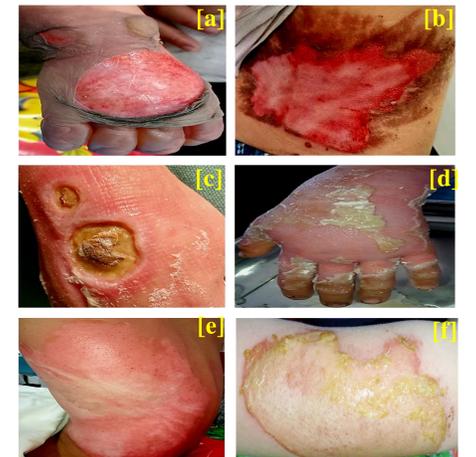
According to the World Health Organization (WHO), around 11 million people suffer from burns each year and there will be 180,000 deaths due to these injuries [3, 4].

Conventional burn treatments is often limited due to their variable efficiency, their possible adverse effects, and their unavailability [5]. The use of natural products from traditional medicine, have long since proven their effectiveness for the treatment of burns, and have very interesting advantages from an availability, safety and low cost [6].



Urtica dioica

Among the Mediterranean basin medicinal plants, *Urtica Dioica* or nettle is used in certain traditional and therapeutic food preparations relating to its diversity in antioxidant compounds. Its richness in bioactive molecules gives it a multitude of therapeutic virtues as antioxidant and anti-inflammatory drugs [7, 8], antimicrobial [9], or even analgesic and antiarthritis [10] but also an important regenerative capacity of cells as well as the activation of the healing of wounds [11, 12].

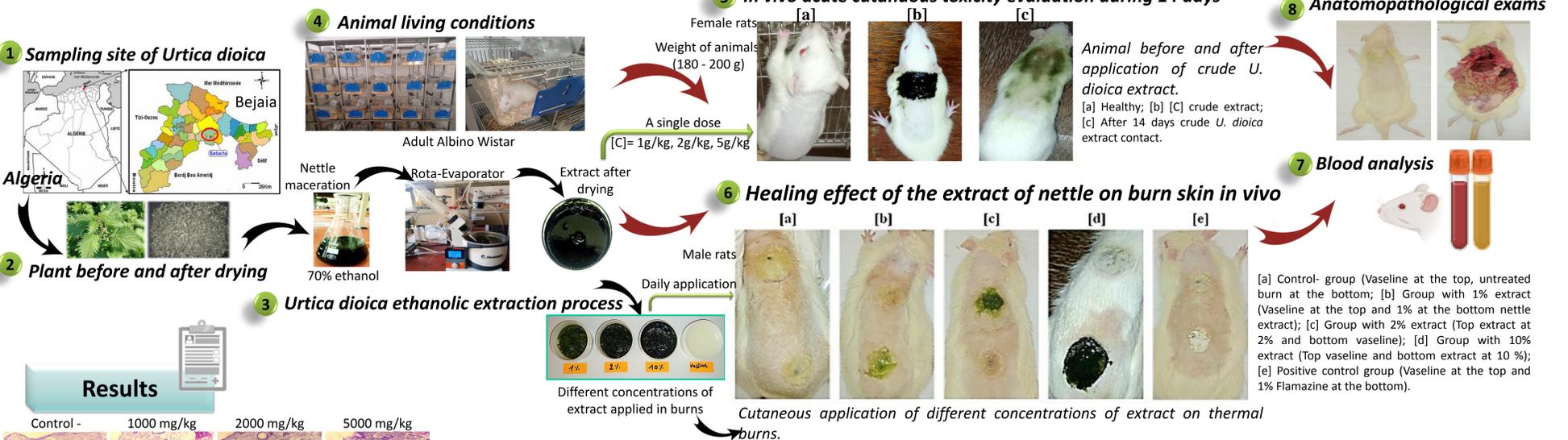


Burns caused by different agents
[a] Oil; [b] Electric; [c] Chemotherapy treatment; [d]: Mixture of tobacco extract; [e]: Flame; [f]: Flame.

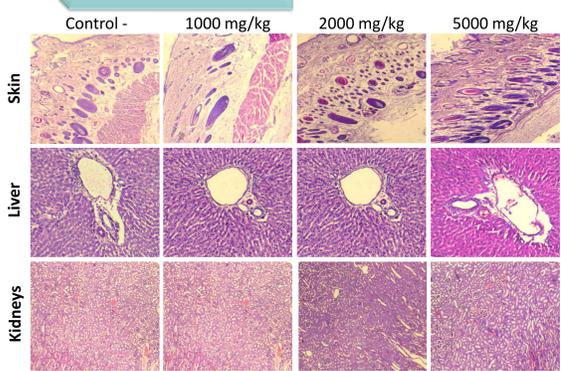
Objectives

The aims of this work is to evaluate the potentially healing and toxicological effect of crude *Urtica dioica* leaves extract through an *in vivo* study.

Methods

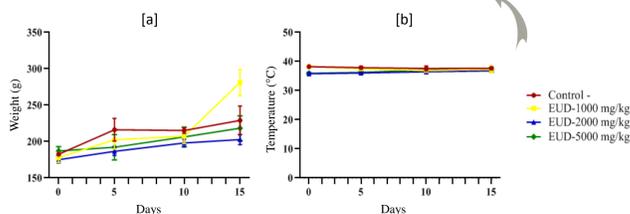


Results



Photomicrographies of the skin, liver and kidney from females evaluating acute toxicity (GX100)

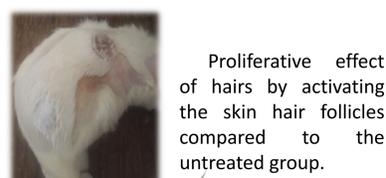
Gradual increase in body weight and stability of body temperature between the rats of the various treated groups compared to the Control group ($p < 0.05$).



Variations in weight and body temperature of animals treated with nettle extract for 14 days.

Control -: Untreated rats; EDU-1000 mg/kg: Rats treated with 1g of *U. dioica* extract; EDU-2000 mg/kg: Rats treated with 2g of *U. dioica* extract; EDU-5000 mg/kg: Rats treated with 5g of *U. dioica* extract.

During the 14 days of experimentation, no mortality or morbidity were recorded following the application of the extract.



Histopathological observation of skin, liver and kidneys revealed no particular abnormality following cutaneous application of the extract.

Biochemical analysis of the rats blood treated with cytotoxic doses.

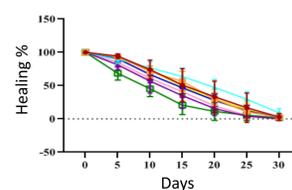
Groups	Liver parameters			Kidney parameters		Inflammatory parameter
	ASAT (UI/L)	ALAT (UI/L)	Urea(g/L)	Creatinine (mg/L)	CRP (mg/L)	
Control -	105,20 ± 6.93	63.80 ± 6.82	0.40 ± 0.04	3.77 ± 0.14	< 0,2	
EDU-1000 mg/kg	93.63 ± 20.92	60.55 ± 3.07	0.38 ± 0.04	4.06 ± 0.20	< 0,2	
EDU-2000 mg/kg	251.11 ± 39.36	76.75 ± 16.60	0.36 ± 0.04	5.97 ± 1.23	< 0,2	
EDU-5000 mg/kg	137.21 ± 71.02	53.33 ± 27.12	0.32 ± 0.03	5.67 ± 0.69	< 0,2	

ALAT : Alanine Amino Transferase ; ASAT : Aspartate Amino Transferase ; CRP : C réactive Protein.

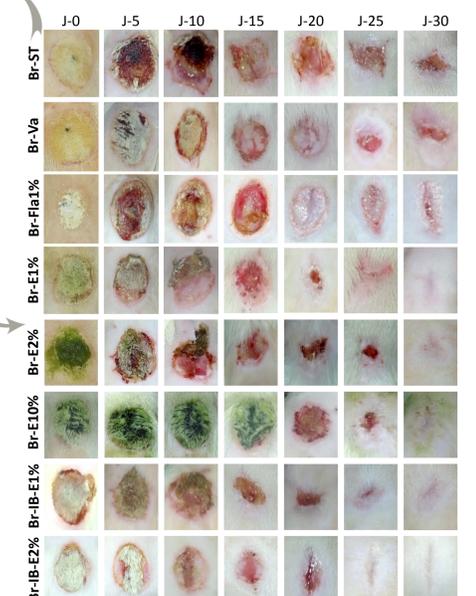
Absence of changes in the analyzed parameters, indicating that liver and kidney function were not affected by the treatments tested on the skin of females, the nettle extract therefore has no acute deleterious effect on physiological functioning liver and kidneys. In addition, no inflammation was observed in the animals following the application of the extract determined by the C-reactive protein assay.

The topical application of the nettle ethanolic extract on burns remarkably improves the wounds healing. Indeed, according to statistical analysis, a significant difference was recorded between the groups BR-ST, BR-VA, Bri-Fla and those treated with the extract of *U. dioica*; BR-E1%, BR-E2% and BR-E10% ($p < 0.05$).

Healing process evolution of burn wounds in Wistar rats



Contraction of wounds from the edge after the 5th day in the groups treated with the extract especially with the 10% extract where a healing rate of 23.22% was recorded.



Burn healing evolution over 30 days of experiment

BR-SE: Burned Rats without extract; BR-VA: Burned Rats treated with vaseline; BR-Fla: Burned Rats treated with 1% Flemzine; BR-E1%: Burned Rats treated with 1% *U. dioica* extract; BR-E2%: Burned Rats treated with 2% *U. dioica*; BR-E10%: Burned Rats treated with 10% *U. dioica* extract; BR-IB-E1%-E2%: Burned Rats and infected with bacterial culture then treated with 1% and 2% *U. dioica* extract.

Conclusion

Urtica dioica ethanolic extract has remarkable healing effects with non-toxic effect on the organism.

References

[1] Jeschke et al. (2020) doi: 10.1038/s41572-020-0145-5. [2] Barrett et al. (2019) doi: 10.1186/s41038-019-0163-2. [3] Almaghoub et al. (2020) doi: 10.1093/jbcr/iraa084. [4] Markiewicz-Gospodarek et al. (2022). doi: 10.3390/jerph19031338. [5] Jayakumar (2014) doi: 10.18052/www.scipress.com/ILNS.29.33. [6] Esmaili et al. (2021) doi: 10.22034/jchr.2021.1932188.1322. [7] Di Sotto et al. (2015) doi: 10.3109/13880209.2014.950386. [8] Zemmour et al. (2017) doi: 10.1080/13880209.2017.1310905. [9] Kregiel et al. (2018) doi: 10.3390/molecules23071664. [10] Gülçin et al. (2004) doi: 10.1016/j.jep.2003.09.028. [11] Laoufi et al. (2017). Antioxidant and wound healing potential of saponins extracted from the leaves of Algerian *Urtica dioica* L. Pak J Pharm Sci 30, 1023–1029. [12] Kasouni et al. (2021) doi: 10.3390/molecules26206248.

