

Phytochemical and pharmacological profile of four Malagasy medicinal plants used in different chronic diseases: the contribution of natural resources in the Malagasy health system

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INTRODUCTION

Traditional medicine plays important role in the Malagasy health system. In Madagascar, medicinal plants are the main remedies for several diseases, especially chronic diseases. Scientific studies are performed to valorise the use of *Imperata cylindrica* (Ic), *Uapaca bojeri* (Ub), *Vaccinium secundiflorum* (Vs), and *Ravenala madagascariensis* (Rm). Ic and Ub are used to treat some inflammatory-related diseases, Vs has an anti-diabetic value, and Rm is known as an antihypertensive. Phytochemical and pharmacological studies were carried out using standard scientific models to justify their properties.

METHODS

- ❖ Total phenolic content and the bioactive compound content by HPLC methods.
- ❖ Antioxidant capacity by DPPH and FRAP assays.
- ❖ An *in vivo* carrageenan-induced paw oedema and acetic acid-induced writhing test in mice were used for anti-inflammatory activity evaluation.
- ❖ An oral glucose tolerance test in mice to evaluate antidiabetic activity.
- ❖ The vascular effects assessed on the phenylephrine pre-contracted isolated rat aorta

RESULTS

Table 1: TPC and antioxidant activities of Vs, Ub, and Ic

Analysis	<i>U. bojeri</i>	<i>I. cylindrica</i>	<i>V. secundiflorum</i>
TPC (mgGAE/100 g of DW)	5854.17 ± 1247.65	1920.63 ± 360.62	4151.02 ± 745.21
IC ₅₀ free radical scavenging effect (µg/mL)	33.32 ± 0.69	192.07 ± 0.78	76.06 ± 1.08
FRAP assay (mmol Fe ²⁺ / Kg of DW)	70.17 ± 9.53	29.60 ± 0.55	69.31 ± 3.31

*DW = dried weight

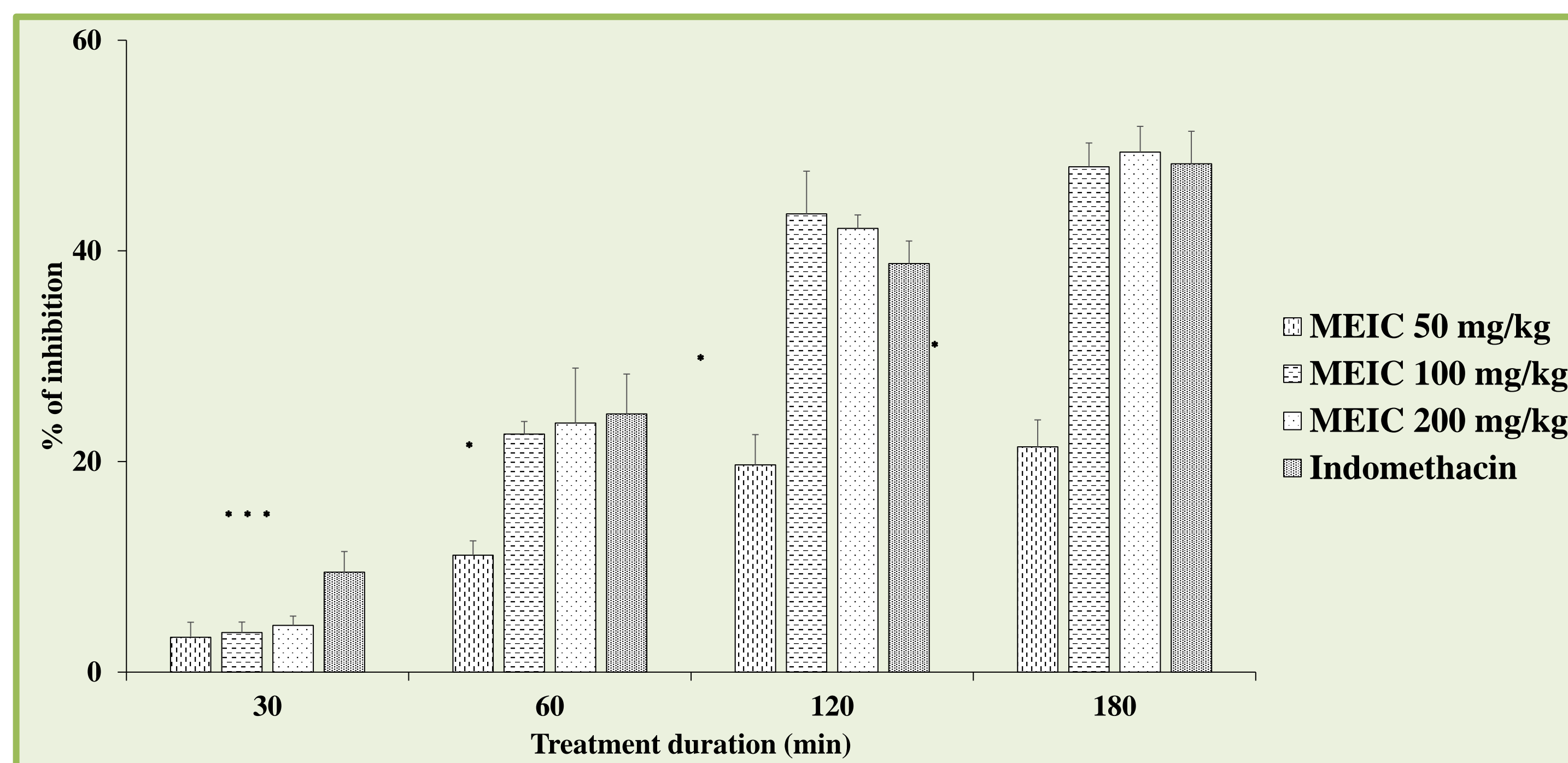


Figure 1. Effect of the MEIC (50, 100, and 200 mg/kg) and indomethacin (10 mg/kg) drug on the carrageenan-induced (2%, 100 µL) paw oedema in mice (n=5).

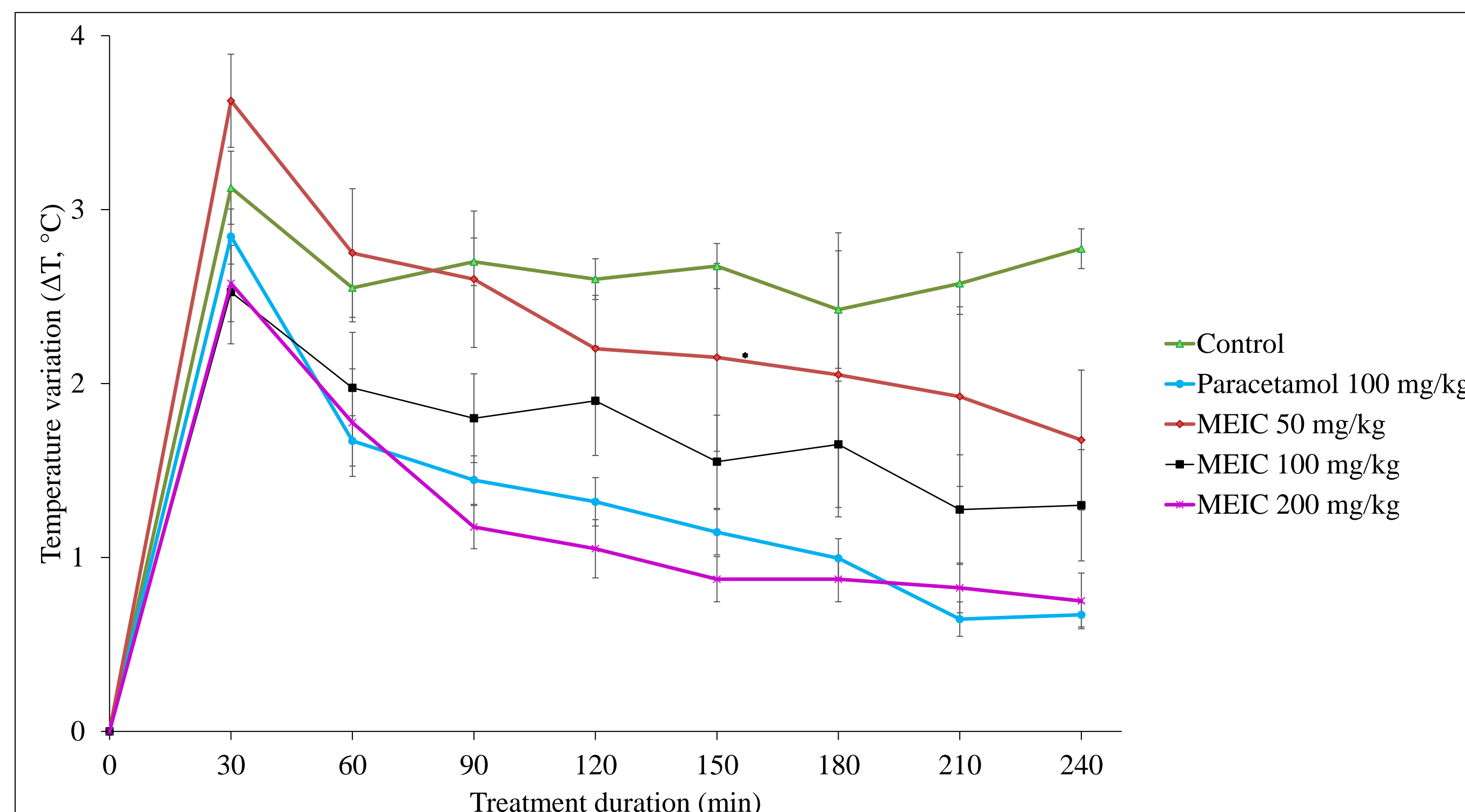


Figure 2. Effect of the MEIC (50, 100, and 200 mg/kg b.w.) and paracetamol (100 mg/kg) on the variation of the body temperature (ΔT) in LPS-induced (100 µg/mL, i.p. route) in mice (n = 6).

Table 2: Analgesic effect of the methanol extract of Ub and Ic (n = 5).

Treatment	Dose (mg/Kg)	Number of writhes (5–25 min)	Inhibition (%)
Control	-	24.90 ± 2.25	0
Indomethacin	10	3.90 ± 1.12 ^a	84.34
<i>U. bojeri</i>	50	19.00 ± 1.15 ^c	23.70
	100	16.70 ± 0.82 ^b	32.93
	200	13.20 ± 0.72 ^b	46.99
<i>I. cylindrica</i>	6.25	38.20 ± 1.56	17.61
	12.5	27.60 ± 2.03	39.95
	25	24.80 ± 1.07	46.04
	50	22.20 ± 0.86	51.98

The data represent the mean ± S.E.M.

a: p < 0.001; b: p < 0.01; c: p < 0.05 vs Control

ANOVA p < 0.01 Leaf & bark

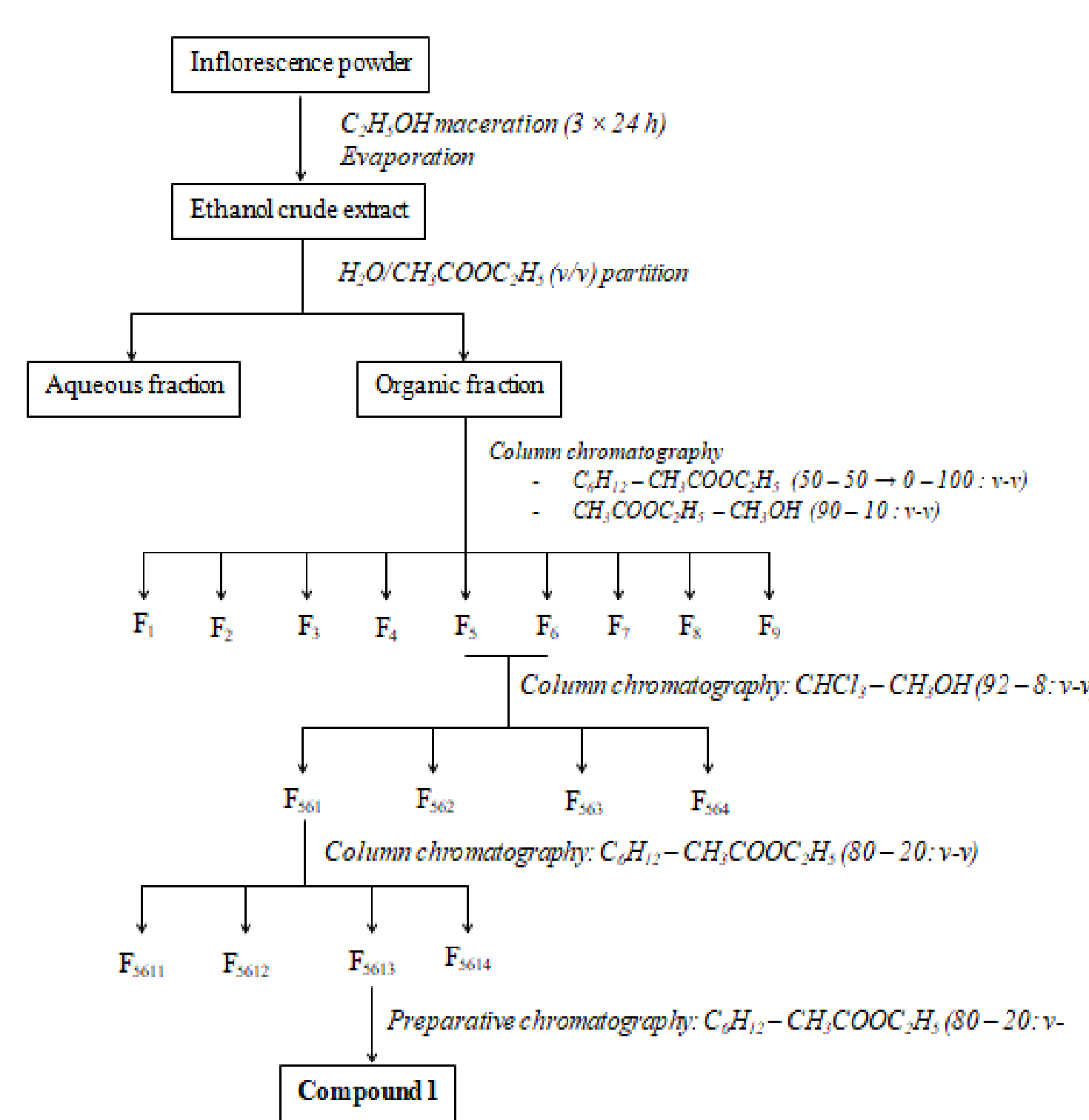


Figure 1. Diagram resuming the bio-guided fractionation of the *R. madagascariensis* inflorescence ethanol crude extract and the isolation and purification of its vaso-relaxing bioactive molecule.

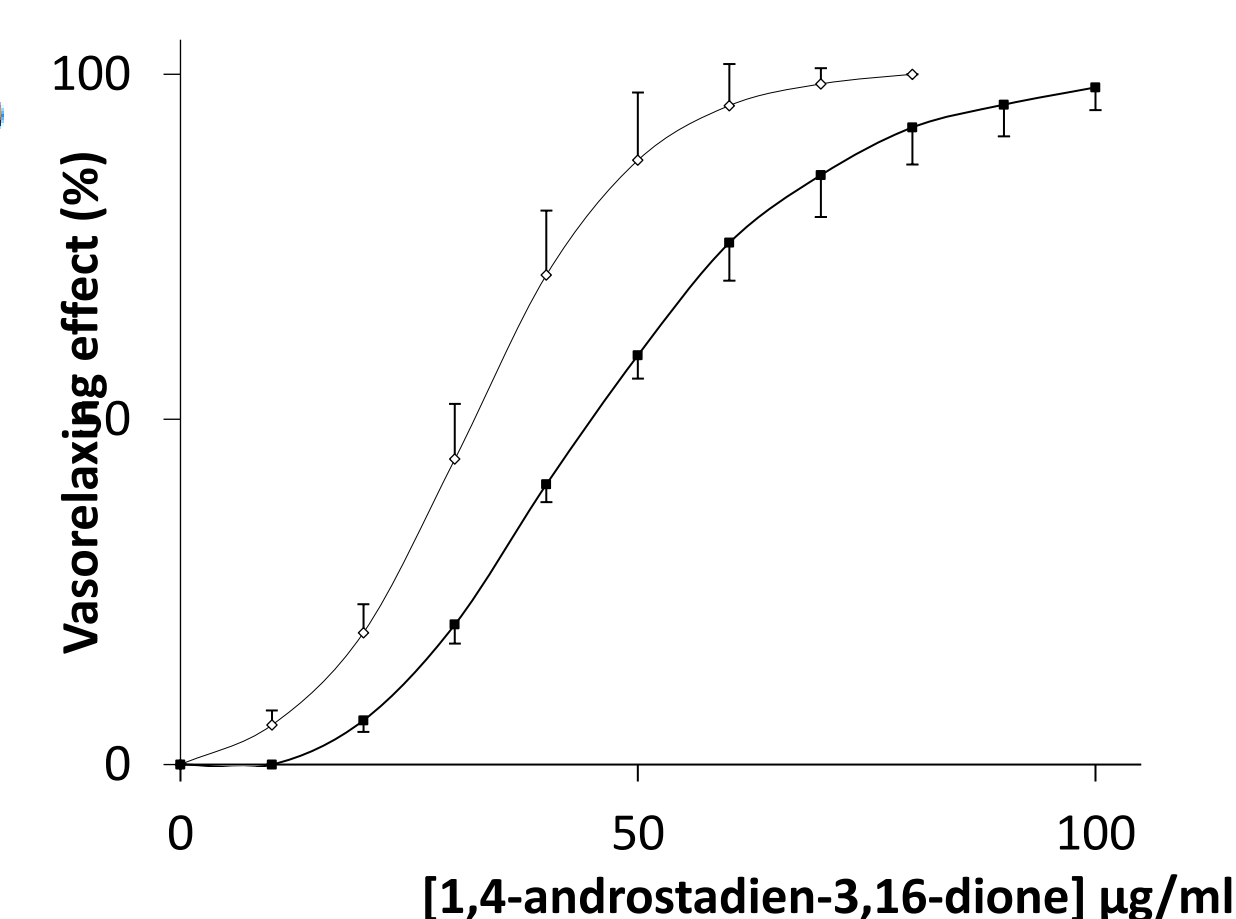
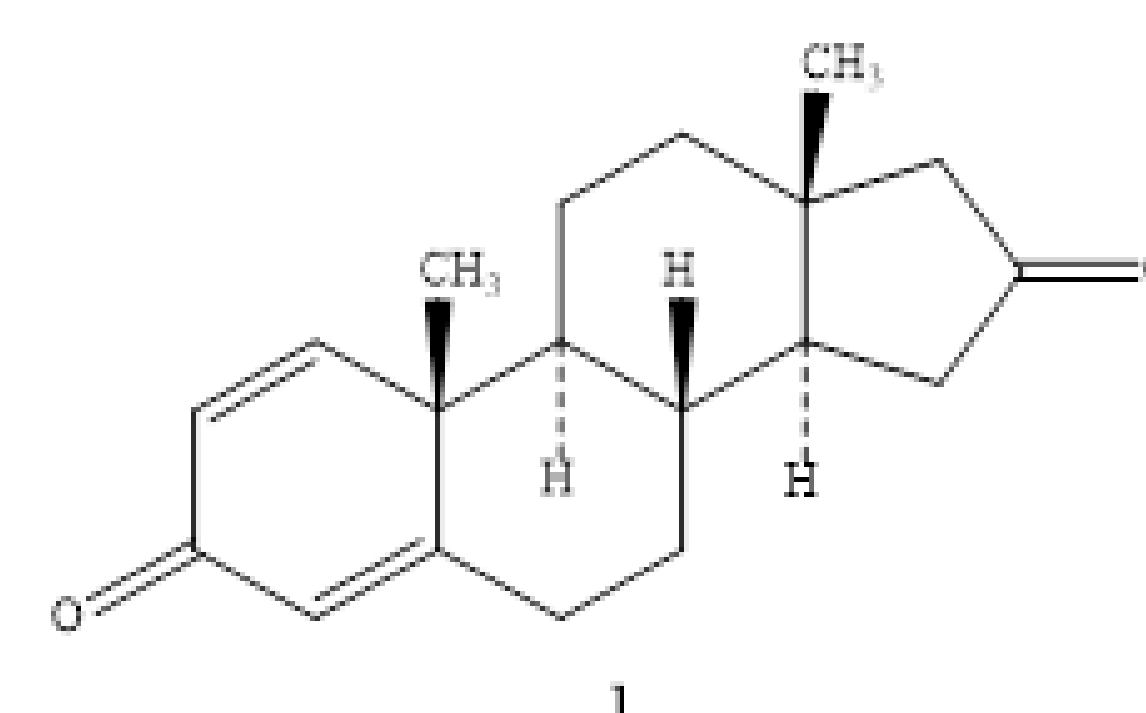


Figure 4. The vasorelaxing effect of 1,4-androstadiene-3,16-dione cumulatively injected at the plateau of the contraction induced by 10⁻⁷ M phenylephrine (○) or 40 mM KCl (●) on isolated rat aorta (n = 4).

CONCLUSION

Firstly, the antioxidant, analgesic, anti-inflammatory, and/or vasorelaxant activities of the crude methanol extracts (ME) of the selected plants were evaluated according to ethnomedicinal information. The ME of Ic, Ub, and Vs showed potent antioxidant activities on DPPH and FRAP methods. These species are rich in phenolics, flavonoids and organic acids, known for their antioxidant activities. They also possess significant analgesic and anti-inflammatory activities respectively assessed on the pain model caused by acetic acid (1%) and on inflammatory oedema induced by carrageenan in mice. Sitostenone was isolated as an analgesic and anti-inflammatory compound from Ic. Ub, and Vs ME; it significantly reduced the glycemia level after 30 min of glucose loading in mice compared to glibenclamide. Androsta-1,4-dien-3,16-dione was isolated as the vasorelaxant molecule from Rm responsible for its antihypertensive activity. These results showed that there are some scientific reasons justifying the therapeutic properties of these plants. It is very important to investigate the local use of biodiversity to identify new bioactive compounds, for supporting biodiversity conservation and sustainable development projects in Madagascar.

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