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Optimization of the extraction process for quality control of volatile oil obtained from the fruit of *Pterodon emarginatus* (Fabaceae) occurrent on Brazilian Savana

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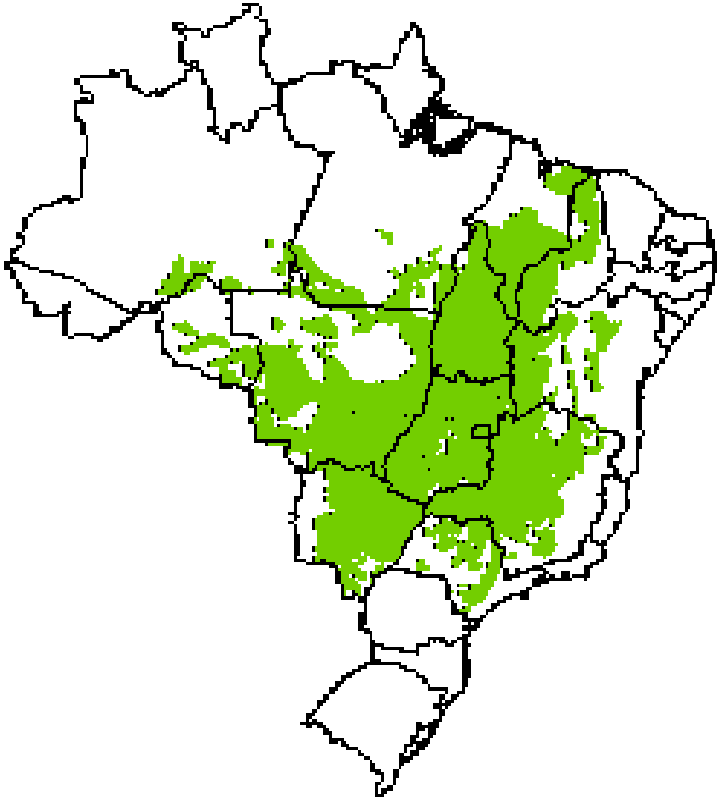
Brazilian Biodiversity

Cerrado – Great Savana



- Greatest hotspost of the world
- 2 million square kilometers
- Big reservation of water – Aquífero Guarany
- peculiar vegetation types

Cerrado´s people...

Sucupira-branca ou Faveiro

Source: Buzatti, 2011.

- *Pterodon appariciοi* Pedersoli
- *Pterodon abruptus* Benth
- *Pterodon polygalaeflorus* Benth

Pterodon emarginatus Vogel.= *Pterodon pubescens* Benth.

Folk Medicine

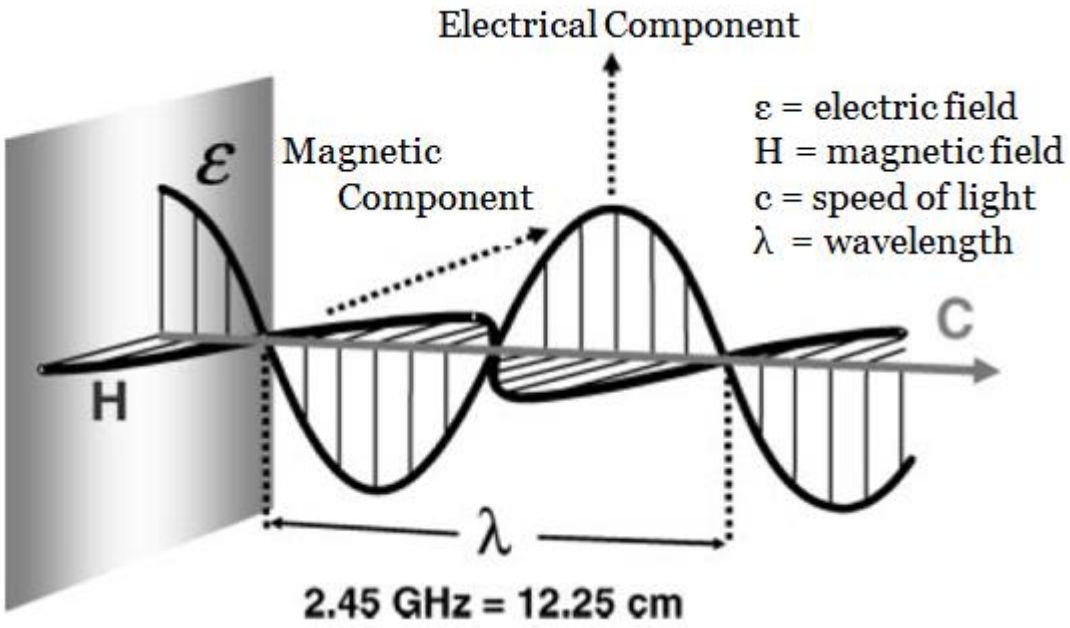
- Antinociceptive
- Antimicrobial
- Antioxidant
- Anti-inflamatory

Objective

- Aimed to optimize the volatile oil extraction process using microwave irradiation and analyze their chemical composition towards the establishment of quality control protocols of herbal drugs made by the fruit of *Pterodon emarginatus* (Fabaceae).

Microwave

Oscillatory and perpendicular fields that can provide better transference of energy!



Source: Kappe et al. (2009), adapted

ion conduction and dipole rotation

Methods

- Central Composite Rotational Delineation (CCRD)
- Variables: time, humidity and power irradiation as 2^3 factorial design with center point and 13 experiments

Table 1: Real and coded levels of the independent variables in the volatile oil extraction process of sucupira's fruit

Variables	Levels		
	- 1	**0**	**1**
X1	21	30	39
X2	44	50	56
X3	220	250	280

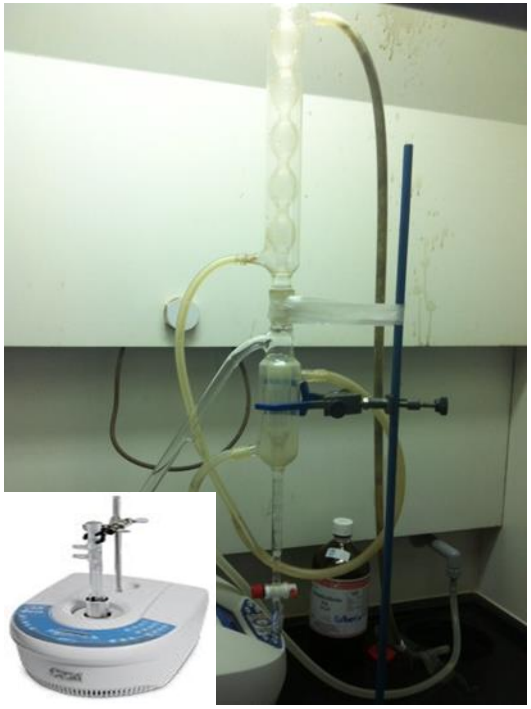
X1= extraction time (min); **X2**= humidity (%); **X3**= power microwave irradiation (W)

Methods

- Results were evaluate by Response Surface Methodology (RSM)
- Residue Analysis was performed at 95% confidence limit ($p < 0.05$), which consisted of the significance test of model fit, based on the analysis of variance (ANOVA).
- Statistics and response surface graphs obtained through the Statistic for Windows version 10.0 of StatSoft (1984-2011).
- Analyze the volatile oil by GC-MS

16°53'21 "S 49°15'12"W

30 g



Discovery SP and Clevenger

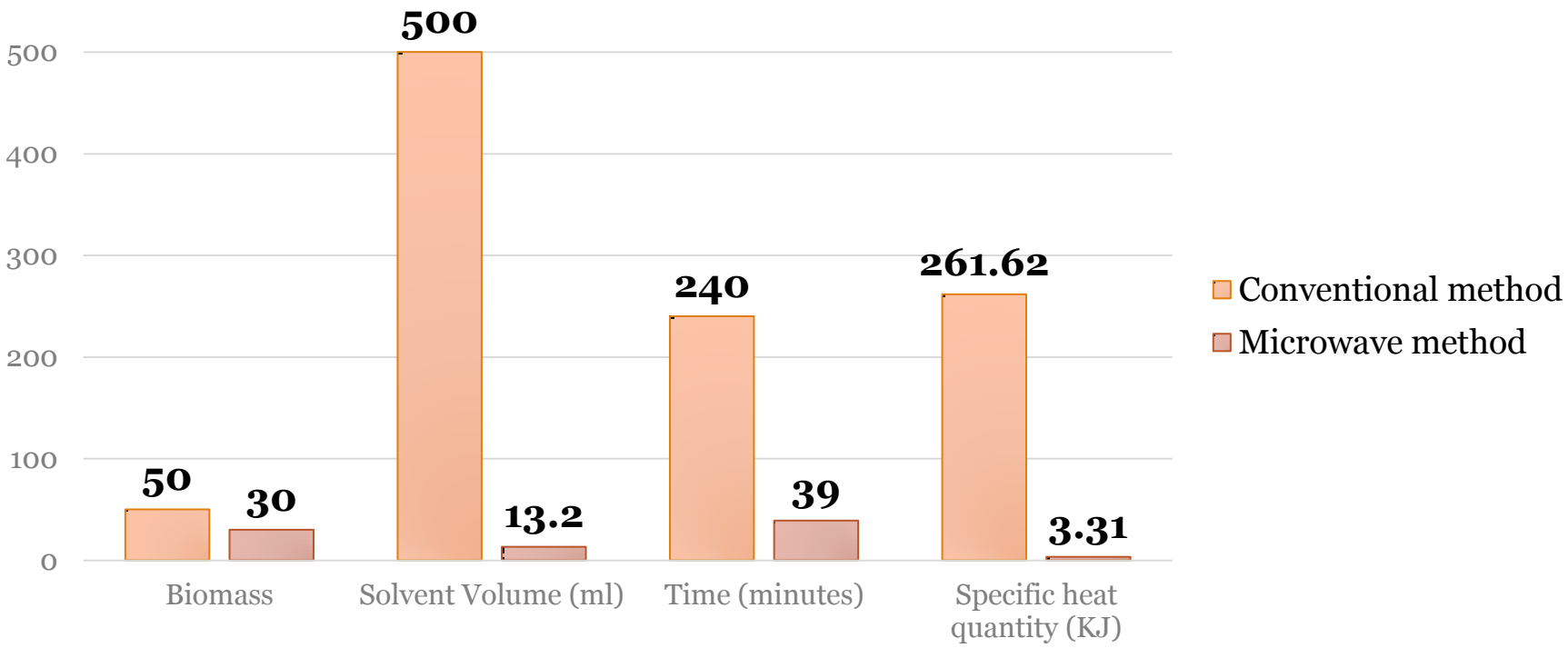
CG - MS

Shimadzu gas chromatograph model QP 2010 GC coupled to Ultra mass spectrometer: column RTX-5MS 30 cm, drag gas He.

Results

MAE x Clevenger

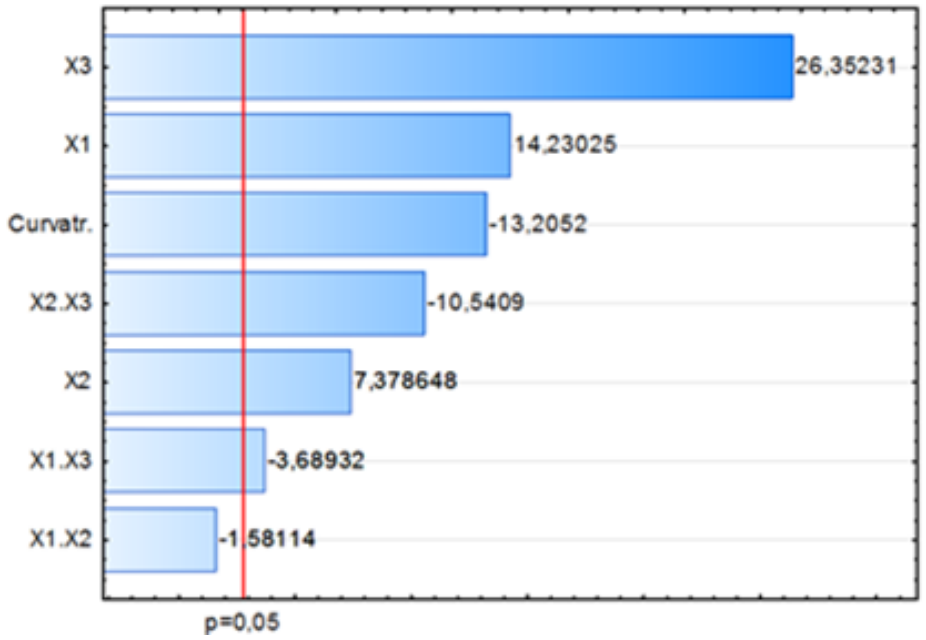
Medium Volume and Medium Yield		
	Volume (mL)	Yield (% v/w)
Conventional method	1.80	3.60
Method microwave	1.73	5.76



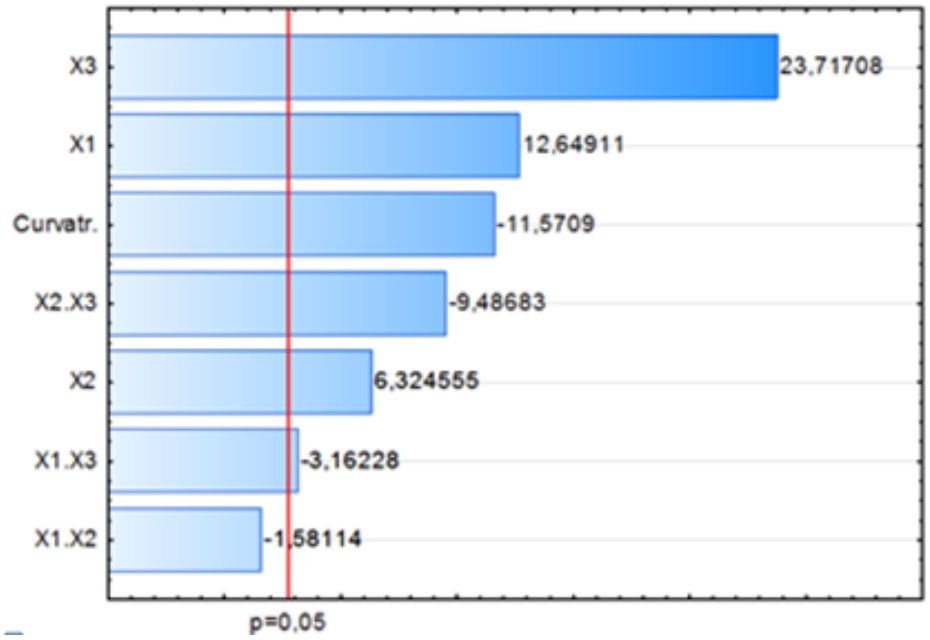
MAE x Clevenger extraction

- 2.16% higher yield
- 6 times faster
- Almost ½ plant material
- 2.64% water
- 1/79 of the energy used in the Clevenger extraction.

Estimate of the effects of variables on the polynomial fit model of variation of the yield process (a) and extracted oil volume (b) versus time (X1), humidity (X2) and irradiation power (X3)



a



b

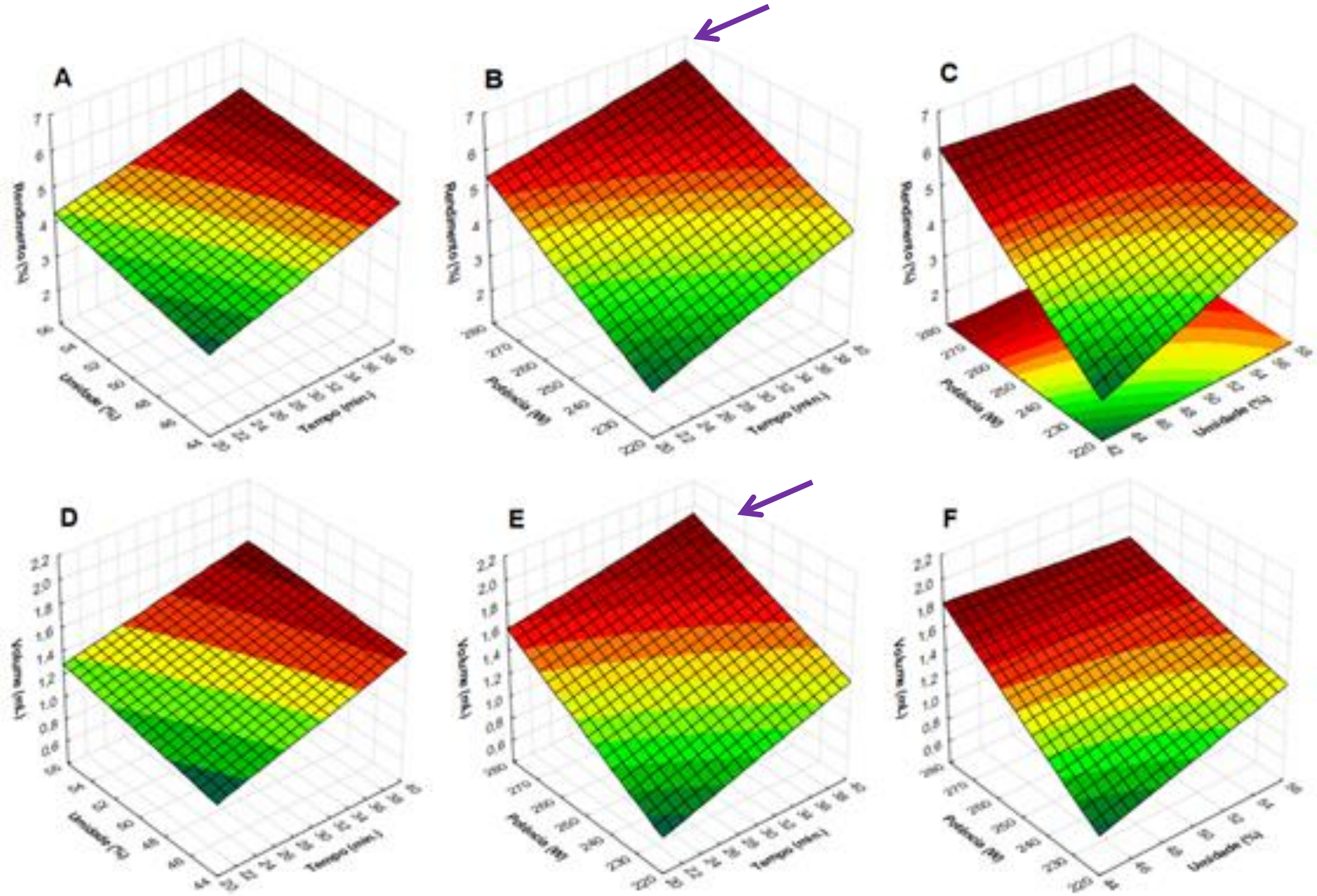


Figure 3 – Response surface showing the effect of extraction procedure on the performance variables (A,B,C) and oil volume (D,E,F)

Parameters that Influence the Microwave Assisted Techniques

- Plant material amount used
- Type of solvent
- Proportion vegetable/solvent materials
- Bottle shape
- Distillation system coupled type
- Temperature
- Power
- Extraction time

Chemical composition and rate of volatile oil obtained by microwave irradiation-assisted extraction (MAE) and conventional extraction (CE) of *P. emarginatus* fruits

RI	Compound	MAE Rate (%)	CE Rate (%)
1436	ɣ-elemeno	1,16	**7,02**
1376	α-copaeno	3,54	1,05
1494	isocariofileno	**25,65**	**6,75**
1454	α-humuleno	4,92	2,49
1531	trans-α-bisabolol	**6,24**	--
1469	allo-aromadendrene	1,31	0,92
1523	sis-sesquisabineno	1,23	0,70
1479	ɣ-muuruleno	**48,03**	**47,31**

Conclusions

- MAE can be an excellent substitute for CE;
- It can be performed on an industrial scale to produce with similar chemical profile, but more pure, free from artifacts;
- Required less biomass, significantly reduced the time of extraction, energy use, CO_2 emissions and solvent;
- The method is more effective and bio-sustenaible (yield 2.6% v/top w) to CE.

FAPEG

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Namastê!

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