



ACADEMIA DE CIÊNCIAS FARMACÊUTICAS DO BRASIL
Academia Nacional de Farmácia

FÓRUM: CANABIDIOL COMO MEDICAMENTO CIÊNCIA, TECNOLOGIA E REGULAMENTAÇÃO

- TECNOLOGIAS DE EXTRAÇÃO -

Dr. Euclides Lara Cardozo Junior

Características da Planta

Cannabis

- Família *Cannabaceae*

Cannabis
Humulus
Celtis
+ oito gêneros

- Centro de Origem – Nordeste do Planalto Tibetano

- Classificação:
 - *C. sativa* subsp. *sativa*
 - *C. sativa* subsp. *indica*



Cannabis sativa

Planta herbácea

Família: Cannabaceae

Gênero: *Cannabis*

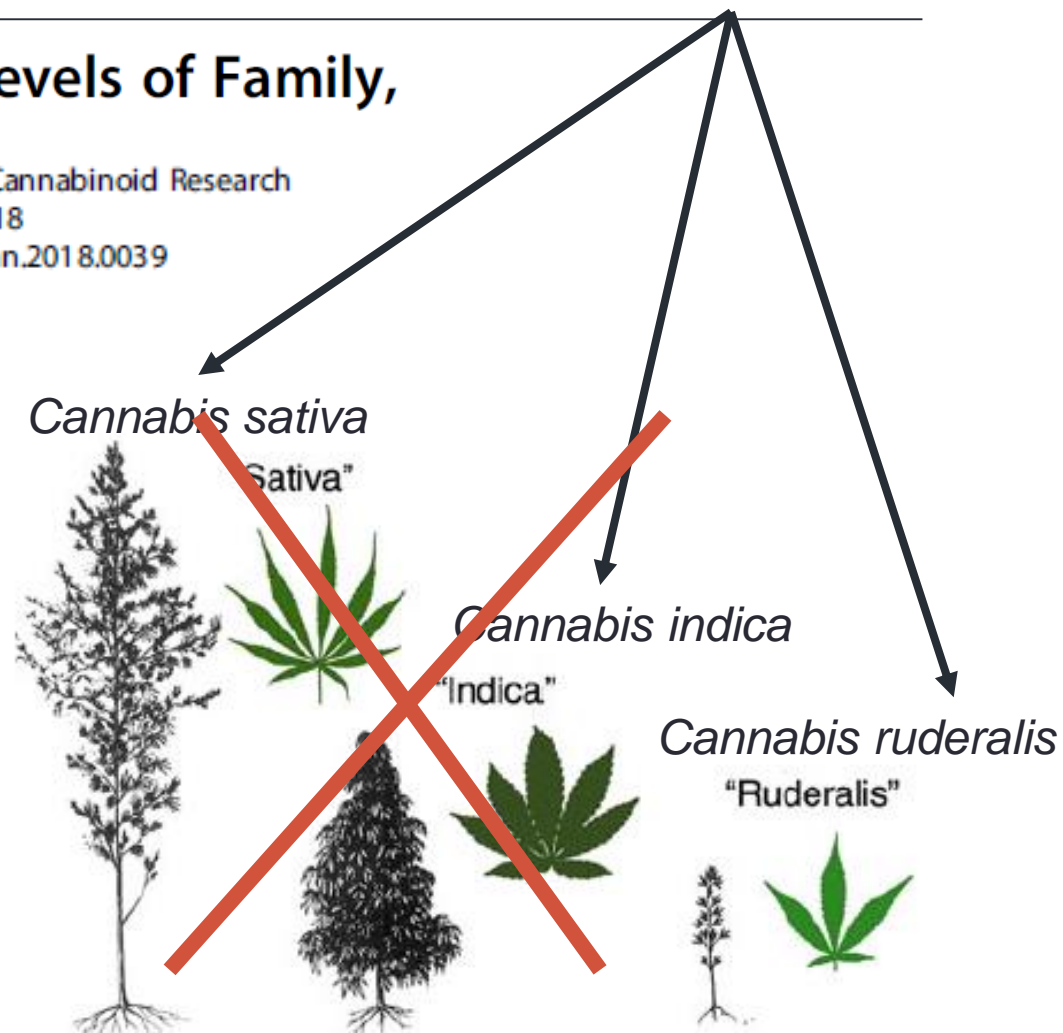
Cannabis Systematics at the Levels of Family, Genus, and Species

John M. McPartland^{1,2,*}

Cannabis and Cannabinoid Research
Volume 3.1, 2018
DOI: 10.1089/can.2018.0039

Categorizing cannabis as either “Sativa” and “Indica” has become an exercise in futility. Ubiquitous interbreeding and hybridization renders their distinction meaningless.

combination of the genus name and a **cultivar** epithet, in any language and bounded by single quotation marks (i.e., Cannabis ‘fibranova’, defines an exclusive name for each Cannabis cultivar.



Cannabis sativa

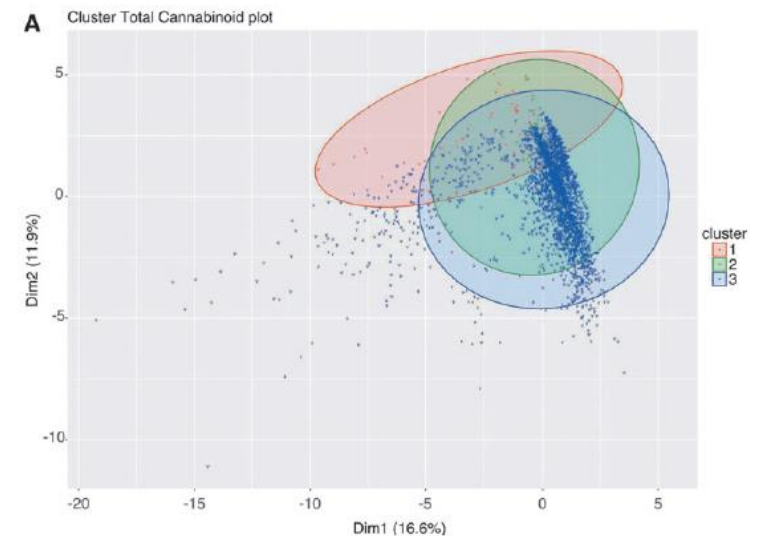
Diversidade genética, química e morfológica.

Cannabis Chemovar Nomenclature Misrepresents Chemical and Genetic Diversity; Survey of Variations in Chemical Profiles and Genetic Markers in Nevada Medical Cannabis Samples

Cannabis and Cannabinoid Research
Volume X, Number X, 2019
Mary Ann Liebert, Inc.
DOI: 10.1089/can.2018.0063

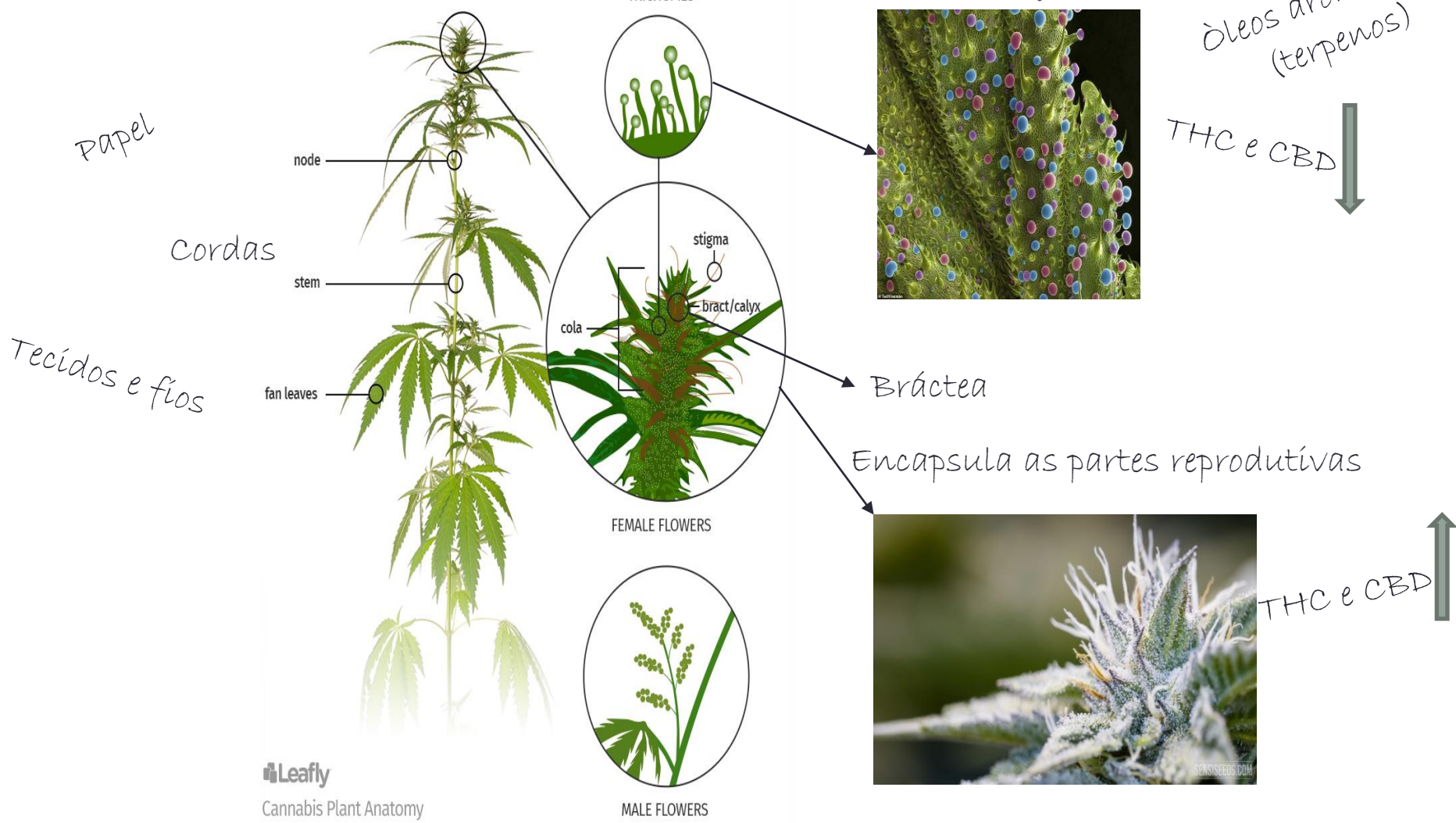
- 2662 samples labeled with 396 **chemovar** names.

- Little variability in the chemical profiles;
- High-THC **chemovars** that lacked significant amounts of other cannabinoids were most abundant.
- The three **chemovars** and twelve genotypes reflect low medical diversity on the market in Nevada during its “medical use only” phase.

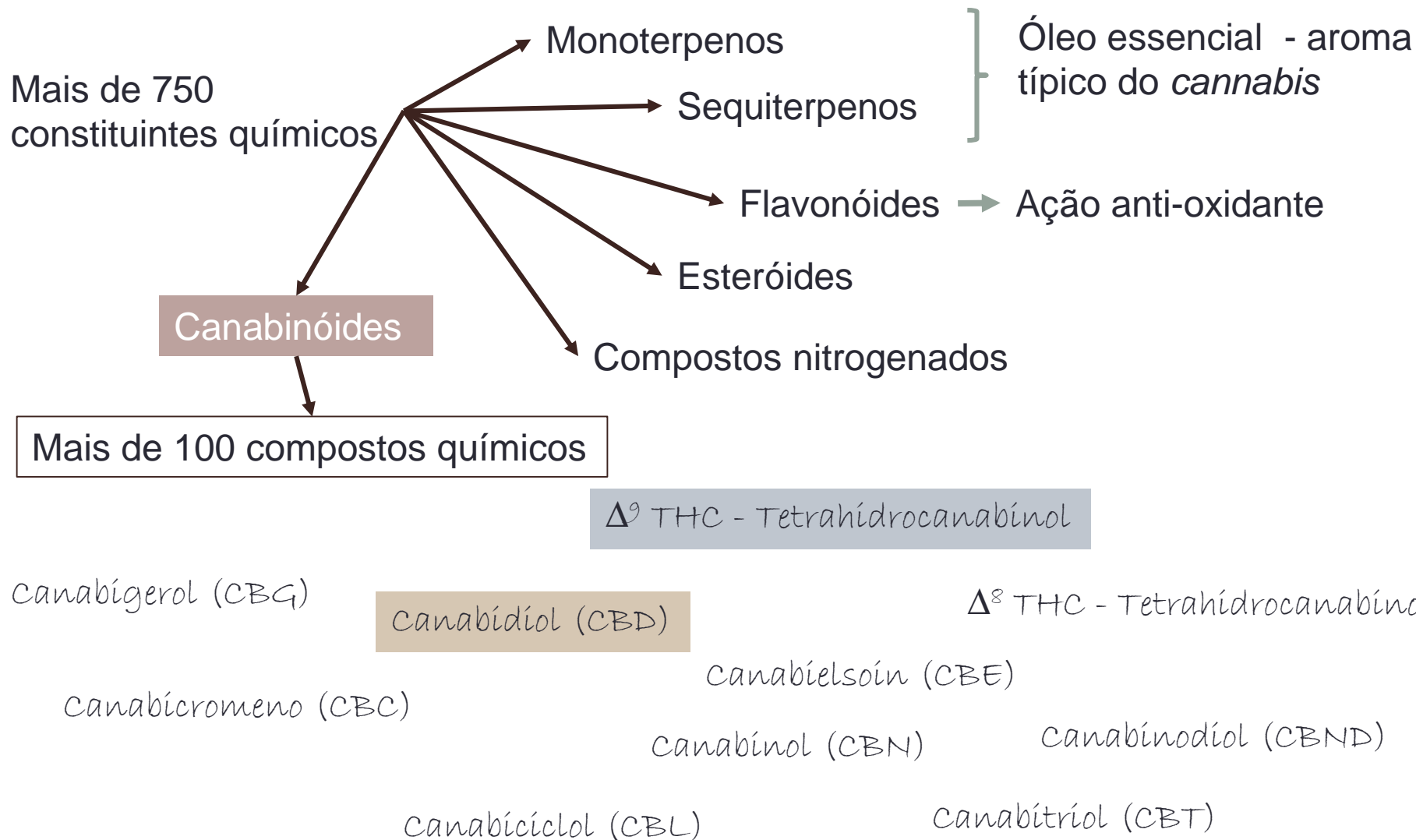


Constituintes Químicos

Anatomia da *Cannabis*



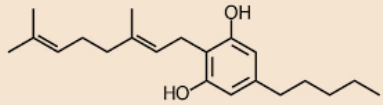
Constituintes químicos da planta



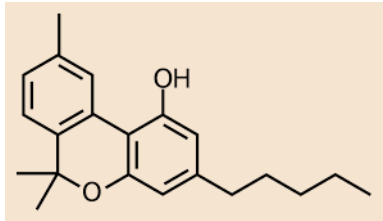
Biossíntese dos *Cannabinóides*

Terpenofenóis

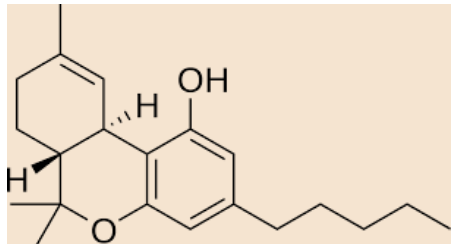
Exclusivos de Cannabis



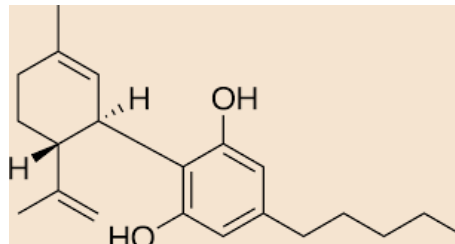
Cannabigerol (CBG)



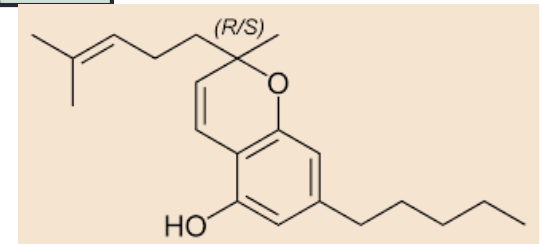
Cannabinol (CBN)



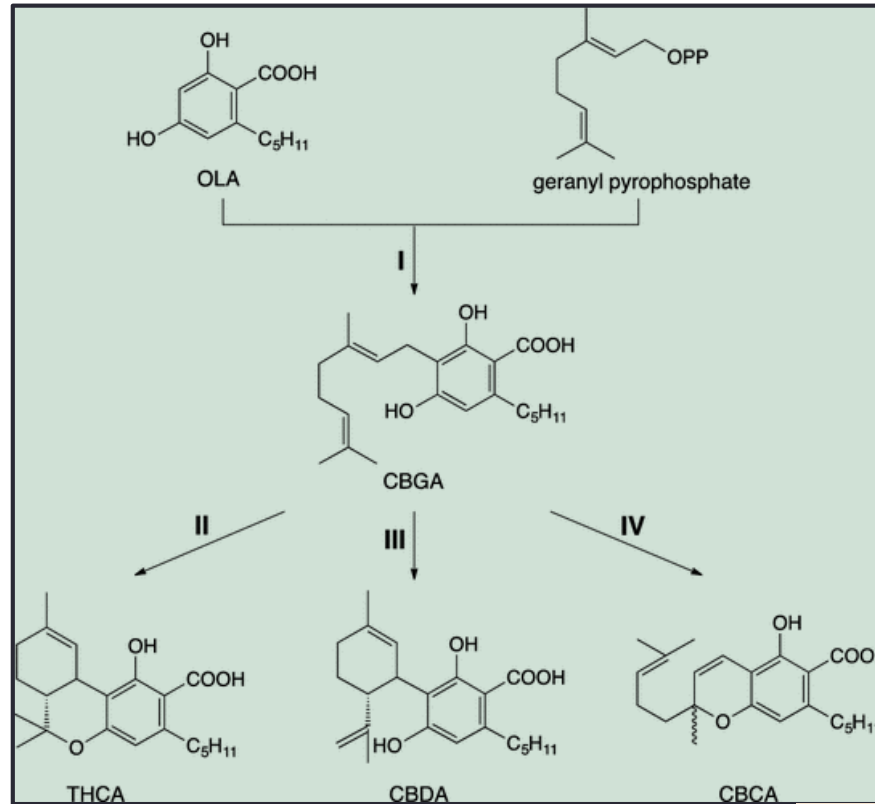
Δ^9 -Tetrahydrocannabinol (THC)



Cannabidiol (CBD)



Cannabichromeno (CBC)



QUIMIODIVERSIDADE:

Quatro esqueletos

Fechamento de anéis

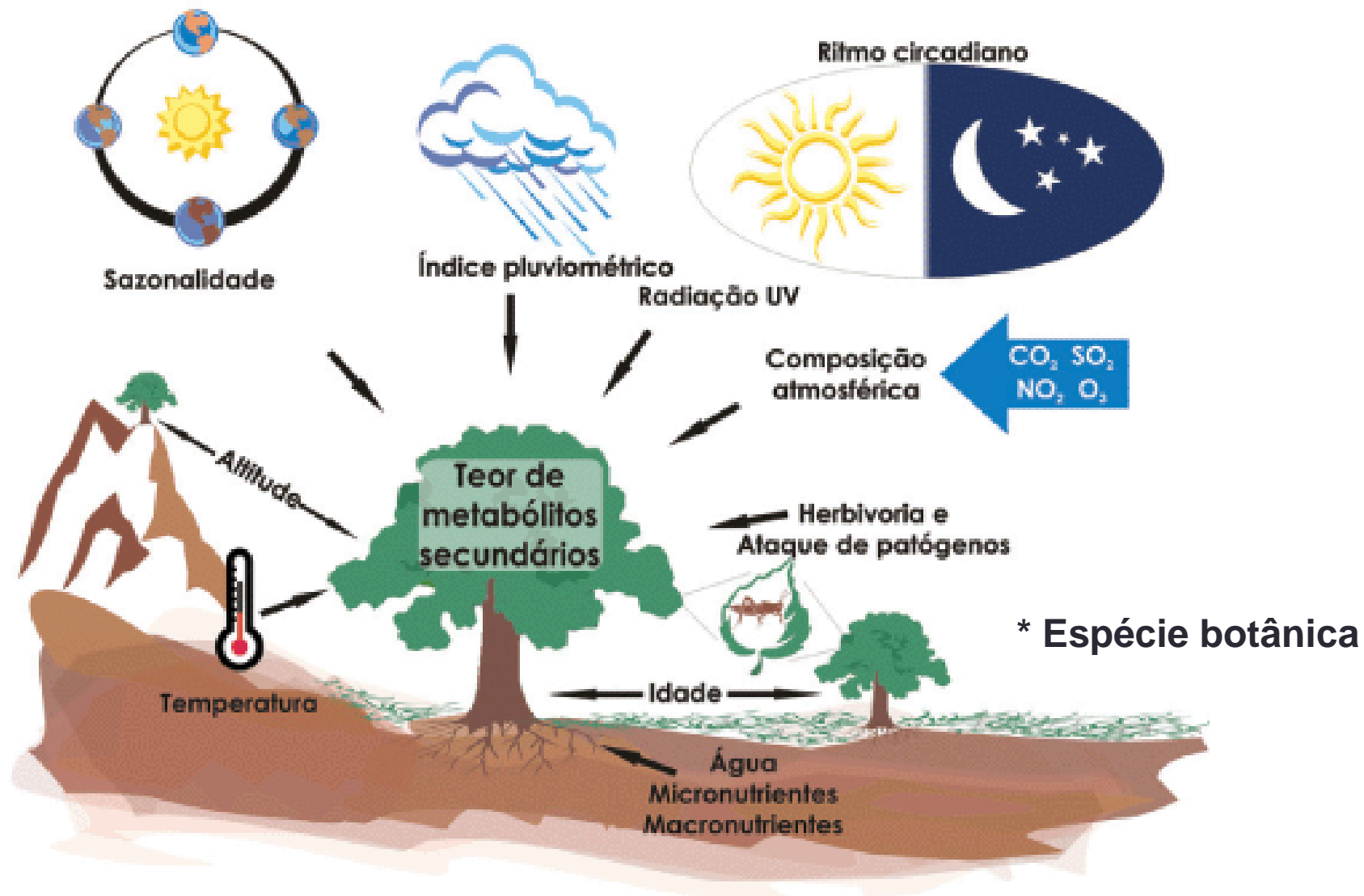
Ác Olivetólico (C₂₁) /

Ác. Divarínico (C₁₉)

carb / Hidrox

Artefatos

Varição qualitativa e quantitativa dos princípios ativos



Métodos de Extração

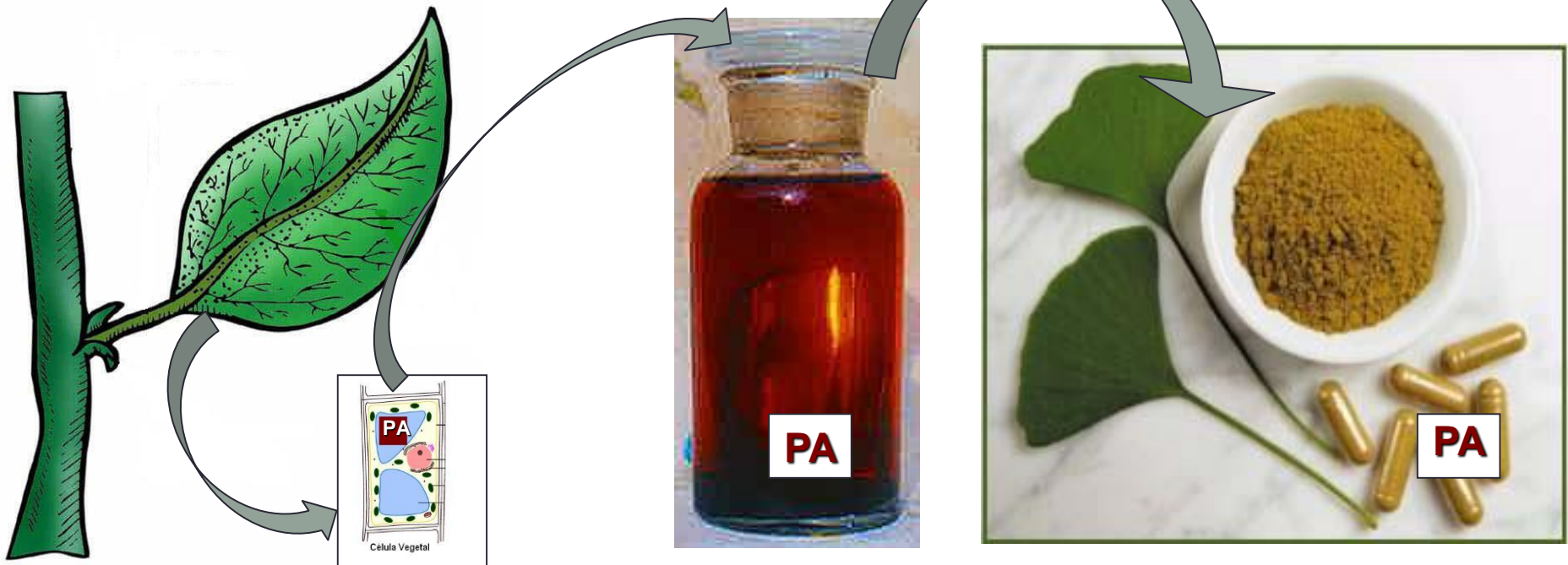
Extração dos Ativos

Processos Extrativos = Manutenção da Quantidade de Ativos

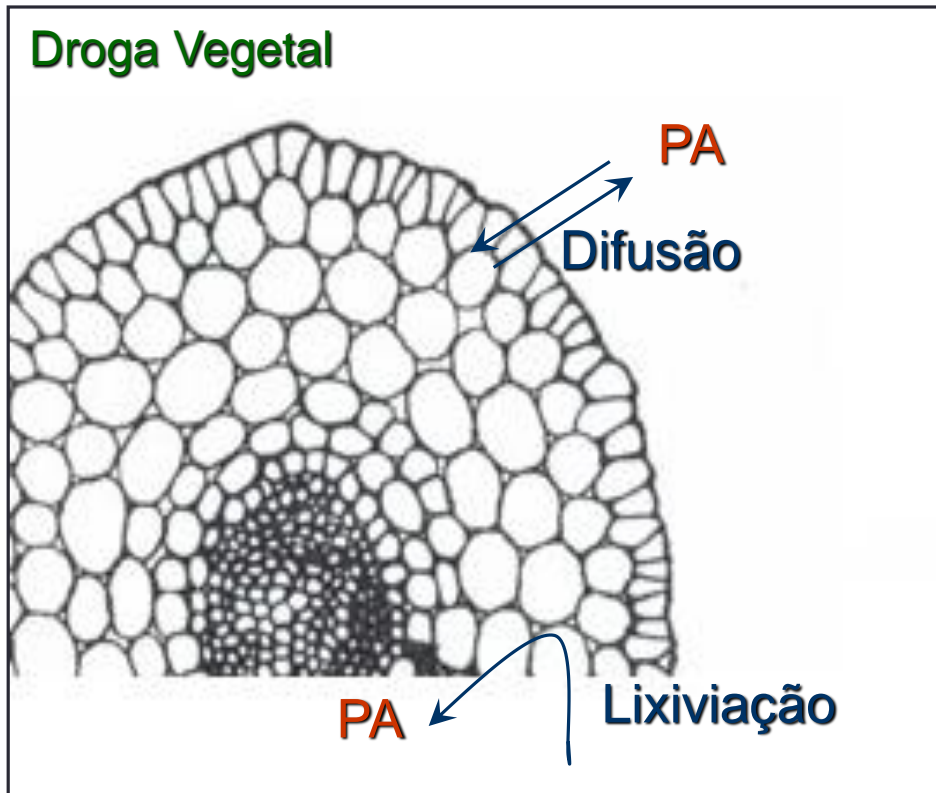
Matéria Prima
- % PA -

Produto Intermediário
- % PA -

Produto Final
- % PA -

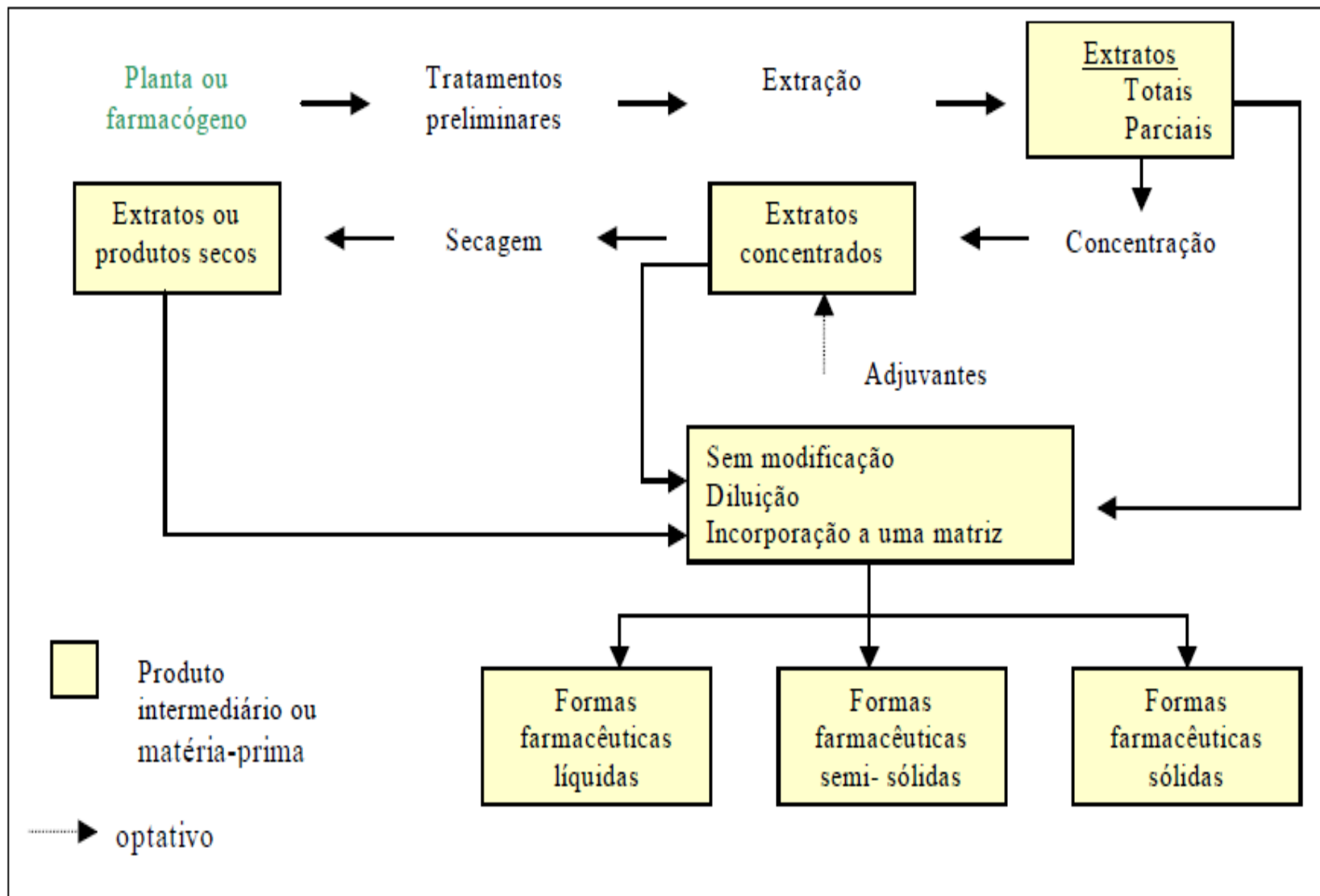


Princípios da Extração



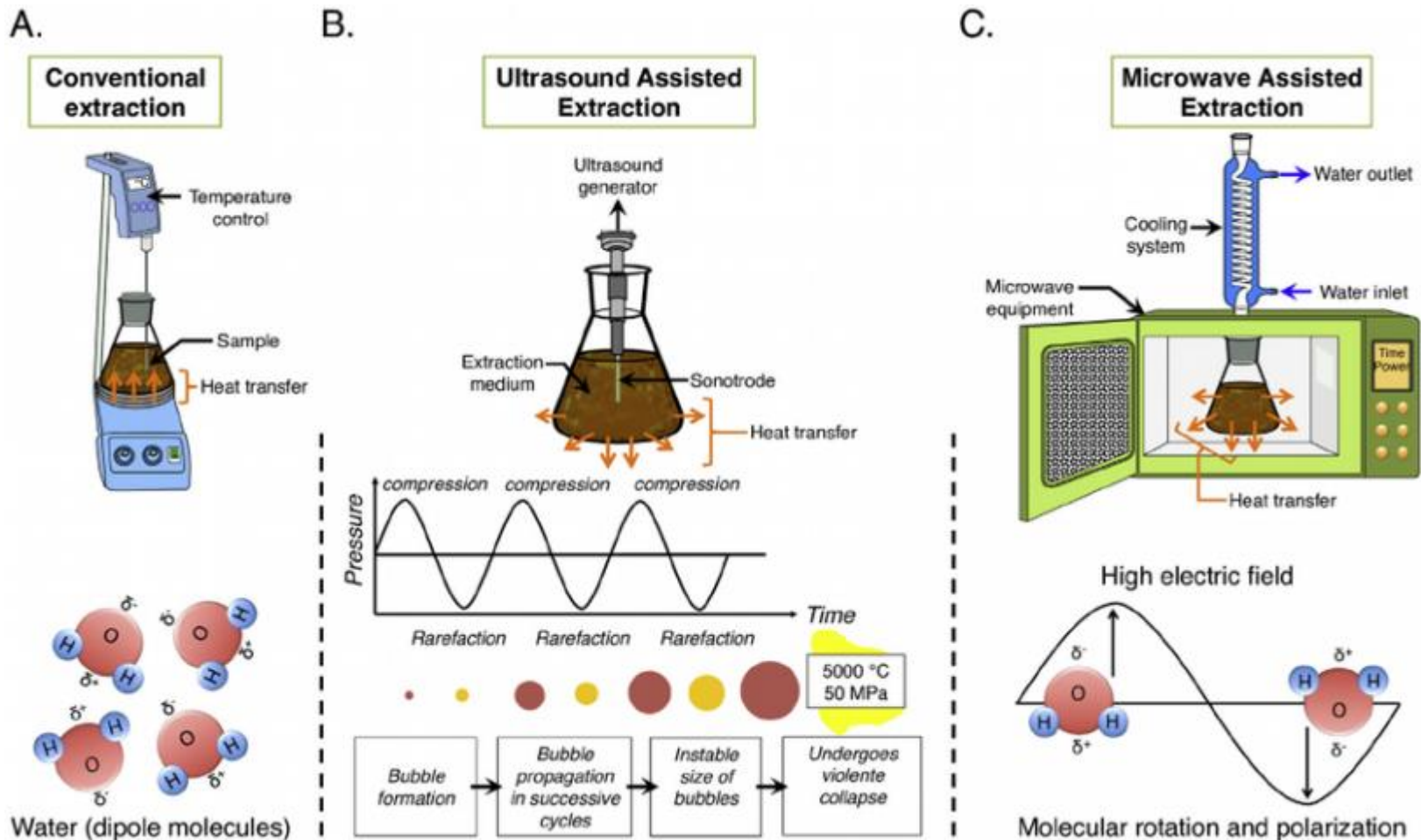
(1) **Lixiviação** das substâncias extrativas para fora das células desintegradas da droga vegetal.

(2) **Difusão** das substâncias extrativas a partir de células intactas da droga vegetal.

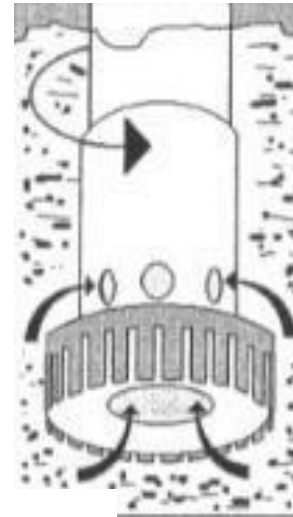


Métodos Extrativos

- Convencional x Ultrassom x Micro-ondas



Maceração x Percolação x Turbólise

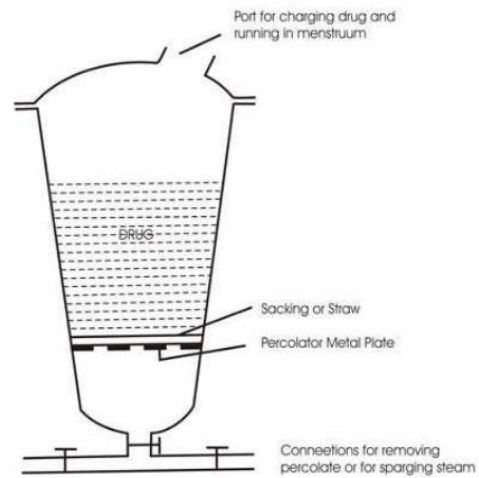


Divisão da Droga

Temperatura

Tempo de exposição

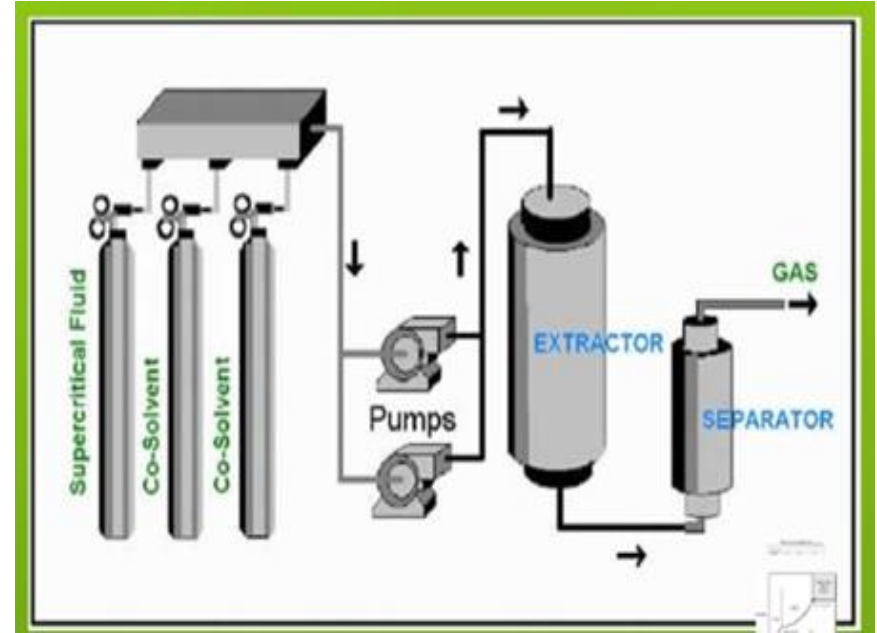
Solvente



Commercial scale (about 1 ton capacity) percolator



Comparado ao BHO, esse método é de mais fácil controle e os extratos ficam com **mais terpenos** (até 10%, no BHO vai de 0,5% à 3,5%).



O método CO₂ Fluído Supercrítico

Extractions of Medical Cannabis Cultivars and the Role of Decarboxylation in Optimal Receptor Responses

Melissa M. Lewis-Bakker,¹ Yi Yang,^{1,2} Rupali Vyawahare,¹ and Lakshmi P. Kotra^{1-3,*}

Table 2. Yields and Cannabinoids Content in the Extracts of Medical Cannabis Cultivars Employing Ultrasound-Assisted Extraction

Solvent	Cultivars	% Yield	Cannabinoid (w/w %) in the extract			
			Δ^9 -THCA	CBDA	Δ^9 -THC	CBD
Hexanes	Cultivar 1	24	22.0±0.4	56.6±1.8	4.7±0.3	8.9±0.4
Isopropanol/hexanes (1:1)	Cultivar 1	48	18.1±0.3	21.1±0.2	3.8±0.1	5.5±0.1
Ethanol	Cultivar 1	30	27.6±0.4	63.8±1.4	3.6±0.1	2.3±0.1
	Cultivar 2	24	2.8±0.1	57.2±0.4	0.2±0.1	9.3±0.2
	Cultivar 3	40	20.5±0.2	0 ^a	2.8±0.1	0 ^a

^aAnalyte is below the lower limit of quantitation (LLQ). (Supplementary Table S1).

Table 6. Yields for Resins (%) and Cannabinoids (w/w %) Using Microwave-Assisted Extraction Conducted at 150°C for 20 Min

Cultivars	% Yield of extract	Cannabinoid (w/w %)		
		Δ^9 -THC	CBD	CBG
Cultivar 1	22.5±0.3	21.4±2.8	21.8±2.3	0.3±0.1
Cultivar 2	19.6±0.4	0	28.1±3.7	1.3±0.3
Cultivar 3	24.4±1.3	54.4±7.3	0 ^a	2.1±0.3

^aAnalyte is below the LLQ (Supplementary Table S1).

Table 3. Yields and Cannabinoids Content in the Extracts of Medical Cannabis Cultivars Employing Supercritical Fluid Extraction

Solvent system ^a	Cultivars	% Yield	Cannabinoid (w/w %) in the extract			
			Δ^9 -THCA	CBDA	Δ^9 -THC	CBD
1	Cultivar 1	22	18.8±0.6	68.8±1.5	5.4±0.1	8.2±0.3
2	Cultivar 1	26	18.2±0.6	10.2±1.4	5.0±0.2	6.6±0.1
3	Cultivar 1	28	22.1±0.4	24.2±0.8	5.1±0.1	5.8±0.1
	Cultivar 2	15	1.1±0.1	62.3±3.4	0 ^b	2.9±0.4
	Cultivar 3	26	45.5±1.4	0 ^b	1.6±0.1	0 ^b

Table 4. Yields and Cannabinoids Content in the Extracts of Medical Cannabis Cultivars Employing Soxhlet Extraction with Ethanol

Cultivars	% Yield of resin	Cannabinoid (w/w %) in the extract			
		Δ^9 -THCA	CBDA	Δ^9 -THC	CBD
Cultivar 1	31	9.2±0.1	25.5±0.4	7.5±0.1	7.8±0.2
Cultivar 2	21	2.0±0.2	72.5±1.9	0 ^a	15.4±0.3
Cultivar 3	31	58.1±0.6	0 ^a	18.3±0.4	0 ^a

^aAnalyte is below the LLQ (Supplementary Table S1).



Cadeia Produtiva de Plantas Medicinais



CADEIA PRODUTIVA DE PLANTAS MEDICINAIS

AÇÕES DE INSENTIVO



Sistemas Produtivos - Organização

- Organização de Agricultores Familiares;
- Capacitação de Agricultores Familiares;
- Planejamento da Produção;
- Assessoria na Gestão.



Sistemas Produtivos - Agrotecnologia

- Produção de mudas selecionadas de plantas medicinais;
- Desenvolvimento de equipamentos de secagem e aquisição de Secadores de Plantas Medicinais;
- Assistência técnica;
- Suporte financeiro para construção de infraestrutura.



Unidade Industrial de Produção de Extratos



CERTIFICAÇÕES:

Autorização de Funcionamento (AFE) para Insumos Farmacêuticos (ANVISA): nº 1.148.74.1

Certificação Orgânica (IBD)

Nacional / USA / Europa: nº PR-283



**Agência Nacional
de Vigilância Sanitária**





OBRIGADO!!!!!!!!!!

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