

ISOLATION OF STRAIN SPECIFIC HIGH QUALITY TERPENES

THROUGH MICROWAVE ASSISTED EXTRACTION

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INTRODUCTION

Many technologies are available to produce cannabis derived products to satisfy an exponentially increasing demand. In addition to the cannabinoids market, the market for end products having the fresh taste and smell of specific cannabis strains is also sharply increasing. The addition of terpene, small molecules synthesized by the cannabis plant, to these end products results in a very real, fresh aroma experience for the final consumer. To address the limitations of the conventional extraction techniques, Milestone has developed and patented (EP 1 439 218, EP 1 618 798 and EP 1 629 725) the ETHOS X for the Microwave Green Extraction of Natural Products. Its process leads in the efficient and fast production of terpenes, providing a complete terpene profile with with a pure smell and taste over all the other extraction techniques. Cannabis extract producers can integrate Milestone's

ETHOS X into their process, maximizing the extraction capabilities, and therefore profitability, of their entire process as represented in the Figure 1. This poster describes how the cannabis plant can be processed using ETHOS X to produce high quality flavoring terpenes, while preserving the quality of the cannabis plant material for the further processing for THC and CBDs extraction with conventional techniques.

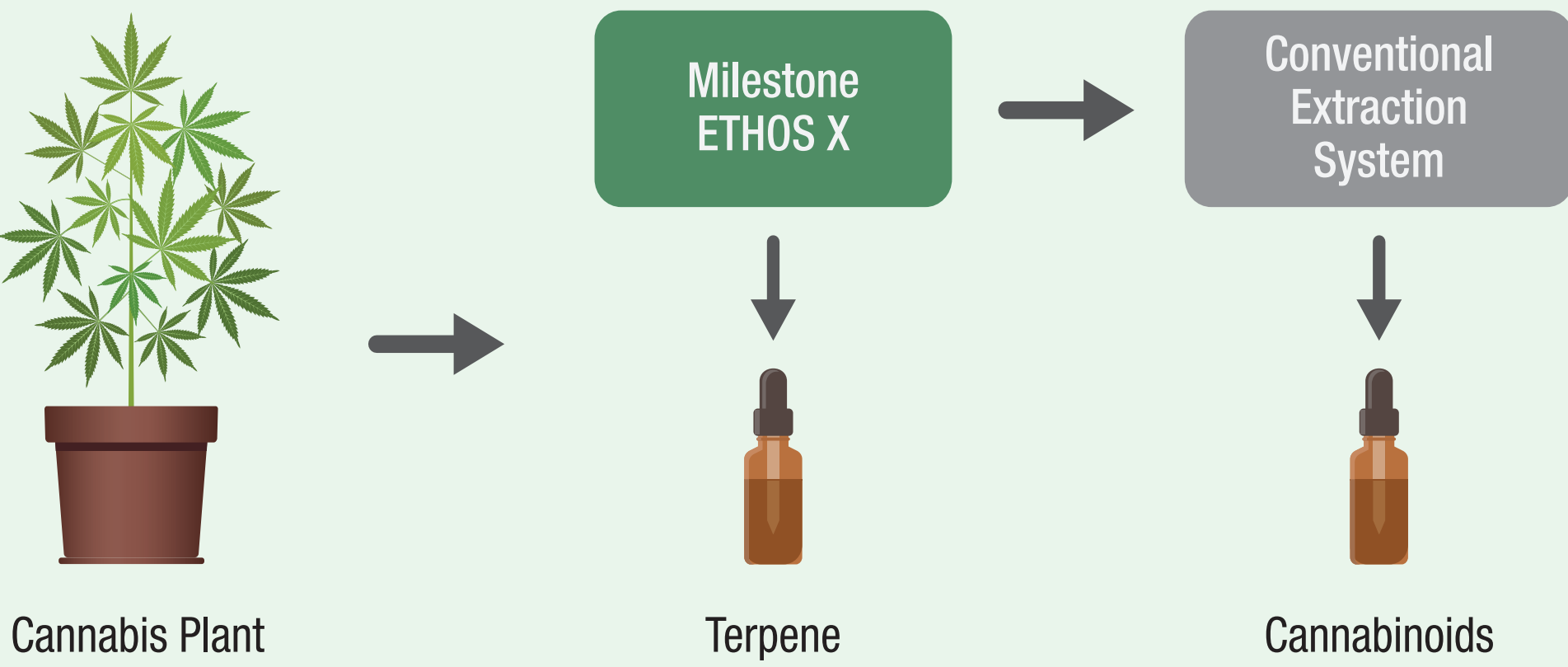


Figure 1 - Cannabis processing diagram with Milestone ETHOS X

EXPERIMENTAL

INSTRUMENT

Developed and patented by Milestone, the ETHOS X is the unique benchtop microwave extraction system able to provide production scale capability in the shortest processing time. Some of its unique benefits are:

- Solvent-free extraction for highest quality
- Shorter run-times combined with user-friendly platform
- Flexible configuration for the lab needs
- Market-leading innovation, safety, and technology

SAMPLES AND REAGENTS

- Cannabis sample: OGKB 2.0 strain
- Distilled water.

TYPICAL PROCEDURE

1. Cannabis sample weight vary based on the ETHOS X reactor volume, (see the table 1)
 - Fresh material, weight it directly in the 5 L ETHOS X glass extraction reactor
 - Fresh frozen material, weight it directly in the 5 L

ETHOS X glass extraction reactor, wait 30 min to thaw before proceeding with the extraction

- Dry material, the plant material has to be moistened prior to start the microwave extraction.



2. Close the reactor with its glass cover, place it inside the ETHOS X, assemble the stainless-steel distillation module and connect to the water chiller.
3. Run the microwave program as shown in table
4. Pure terpene products are collected into the stainless-steel distillation module.

RESULTS AND DISCUSSION

In this specific work, terpene extraction was performed on fresh frozen OGKB 2.0 strain working on 1 kg of cannabis with the 5 L ETHOS X reactor. The sample was microwave treated at constant power for 40 min. After 10 min, the terpene fraction started to be collected in the distillation module, above the water layer. The extraction was completed after 40 min when the terpenes were completely extracted. At the end of the extraction, the terpene fraction was collected from the glass distillation module, frozen for 30 min to remove extra water and then stored in a fridge at 4°C.

ETHOS X EXTRACT - Total Yield* 1.59%	
δ-Limonene	<i>trans</i> -Nerolidol
β-Myrcene	β-Pinene
Linalool	<i>cis</i> -Nerolidol
α-Humulene	Camphene
α-Pinene	<i>trans</i> -Nerolidol

Table 2 - List of the main terpenes in the ETHOS X extract (from OGKB 2.0 strain)
*by weight

The terpene fraction was analyzed via GC-MS providing the fingerprint of the extract. To conclude the evaluation, the cannabis material has been extracted before and after the ETHOS X treatment with closed-loop hydrocarbon extraction to collect the cannabinoids.

CONCLUSIONS

The data shown in this work, demonstrates that the ETHOS X maximizes the extraction of terpenes from cannabis material, without compromising the quality of the THC and other cannabinoids extracted in the following process. Its ability to work with fresh material produces a superior terpene profile that is unmatched by conventional extraction techniques. Moreover, the fast processing times ensures the integrity of all cannabinoids, enhancing the overall

REACTOR SIZE	SAMPLE AMOUNT	MICROWAVE POWER
Small (2 l)	up to 400 g	400 W
Medium (4 l)	up to 1500 g	1500 W
Large (12 l)	Up to 3000 g	1800 W

Table 1 - ETHOS X suggested working conditions

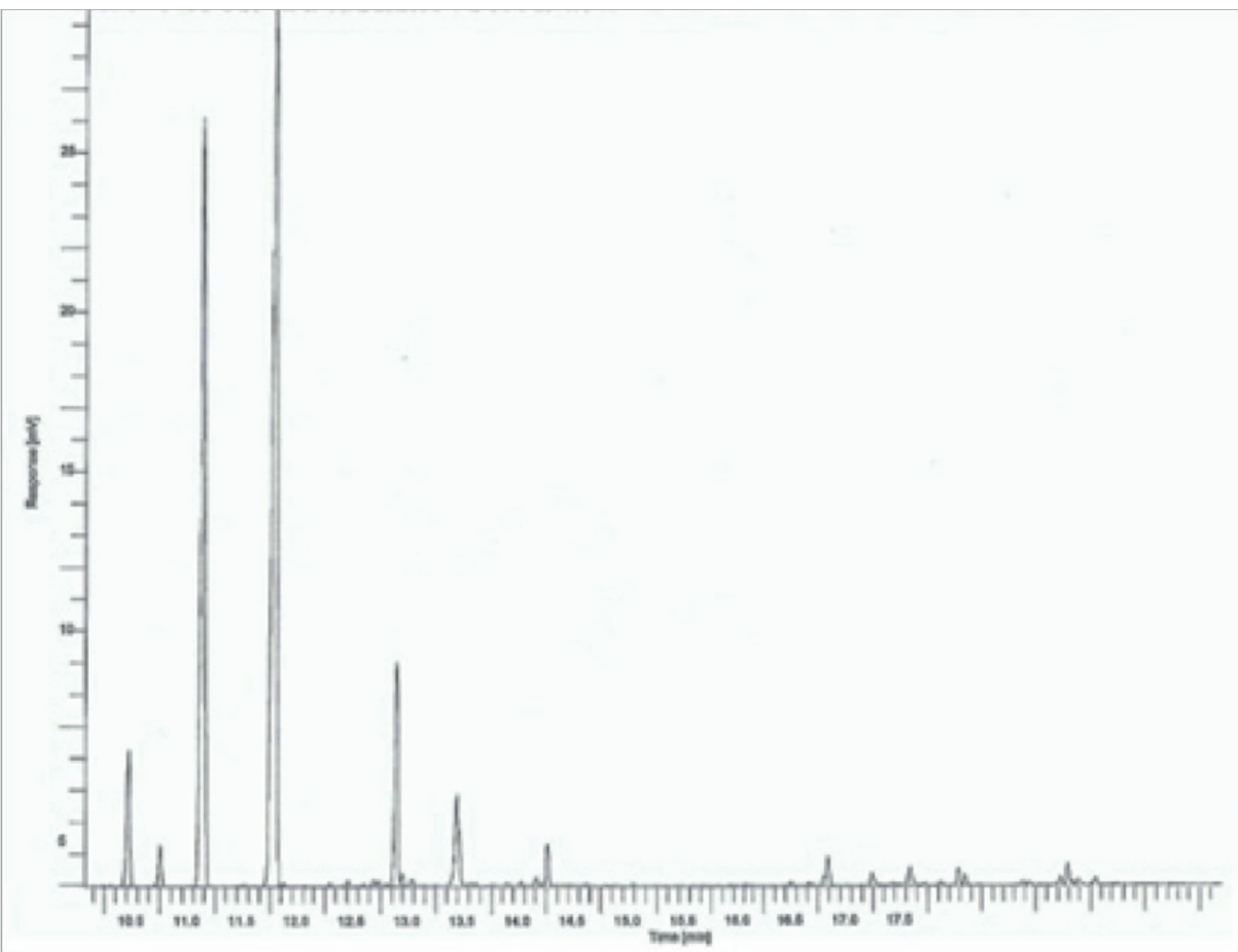


Figure 2 - GC-MS profile of the ETHOS X extract

The potency analysis (Table 3) shows that the ETHOS X did not affect the yield or quality of the cannabinoids (78% in the raw material vs 77% in the processed material). Moreover, the extract is free of cannabinoids, avoiding the need of a purification step.

	Plant Raw Material ^b	ETHOS X Extract	Processed plant material ^d
Terpenes ^a	1.4	1.6	0.1
Total Cannabinoids ^a	78	- ^c	77

Table 3 - Recovery data of terpene and total cannabinoids from the described processing step in Figure 1
^a Data are calculated in yield by weight
^b Extracted with close-loop hydrocarbon extraction system
^c Not detected (<LOQ)
^d Cannabis plant material extracted with close-loop hydrocarbon extraction system after ETHOS X process.

efficiency in the cannabis processing industry and ensuring fast return on investment. Milestone's ETHOS X is proven to be a unique and beneficial tool for cannabis processors, allowing them to obtain terpenes with unmatched quality and completeness in 40 minutes, ready to use for flavoring in edible and recreational products without effecting the cannabinoid quality and extraction process.