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Featured White Paper

Flower Derived Terpenes (FDT) Defined: A New Standard for Cannabis Derived Terpenes (CDT)

By: Robin Christiansen

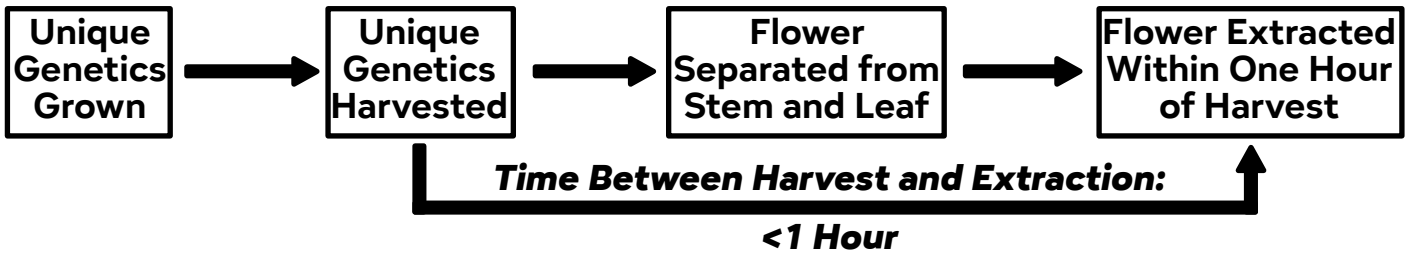
How Loud Spectrum pioneered fresh, flower only terpene extraction, as the only producer of Flower Derived Terpenes (FDT) in the market.

Abstract:



In 2019, Loud Spectrum launched Flower Derived Terpenes (FDT), a revolutionary category of Cannabis Derived Terpenes (CDT). To date, Loud Spectrum remains the only company to manufacture the breakthrough FDT product. Unlike traditional CDT, which are typically extracted from the Whole Plant Biomass (WPBM), including stem and leaf material, FDT is sourced exclusively from flower, and only the flower, and harvested and extracted within one hour of picking. To make that standard commercially viable, Loud Spectrum custom designed and built its own extraction equipment specifically engineered to minimize degradation of cannabis' most fragile aroma compounds while maximizing the capture of the volatile flower terpene aromatics. This white paper describes the breakthrough FDT category and terminology, the strategic extraction methodology and equipment used to achieve FDT, the market position Loud Spectrum has held as the only producer since launch, and the market penetration Loud Spectrum's FDT has achieved by fueling other terpene suppliers' products discreetly for years.

Visual Abstract



1. Introduction: A Category of One in Cannabis Derived Terpenes

The cannabis derived terpene market is described using the broad label Cannabis Derived Terpenes (CDT), separate from Botanically Derived Terpenes (BDT) which are sourced from plants other than cannabis. Within the vast CDT category, meaningful variations exist from the plant material used, the extraction methods, and the speed with which it is processed after harvest that the industry has historically left undifferentiated and undisclosed.

Loud Spectrum pioneered and defined Flower Derived Terpenes (FDT) in 2019 as a specialized and higher standard within the cannabis derived

terpene CDT category. FDT is a terpene product that is sourced exclusively from only fresh flower (no leaf, no stem), always extracted within one hour of harvest, and preserves the most fragile and nuanced terpene minors that traditional extraction methods fail to do. Since this breakthrough, Loud Spectrum has been the only company to manufacture terpenes to this high standard. Other suppliers in the CDT space continue to source their terpenes from the WPBM (flower, leaf, stem) as a way to lower cost, logistics, and infrastructure. Removing the stem and leaf from the flower required added infrastructure cost often ignored by traditional CDT manufacturers. CDT extraction methodology comes with its own set of downfalls, as mixing undesirable terpenes from the leaf and stem adulterate the coveted terpenes that are present in the flower, often requiring post processing and handling of the sub-par CDT. FDT overcomes these inherent problems by minimizing the processing of the terpenes, for a true to strain terpene profile unachievable in traditional CDT.



Figure 1: *Loud Spectrum Flower Derived Terpene (FDT) Bottle*

2. Why Only Flower: Why Only One Hour — Terpene Degradation After Harvest

Flower is where cannabis' superior aromatic complexity is concentrated. Stem and leaf contain some of the terpenes found in flower, but also contain undesirable terpenes that can ruin a batch by introducing off notes. WPBM extraction is more scalable from a yield and logistics cost standpoint, but it blends the flower aroma with WPBM that contributes little aromatic value, dilutes the final profile, and introduces undesirable aromatics like spoiled milk.

Timing and logistics of extraction compound this effect. The volatile aroma compounds that are responsible for cannabis' most distinctive character, especially the lighter and more reactive compounds, have a short window before the issues begin. Terpenes begin degrading from the moment the flower is harvested. They experience oxidation, evaporation, and enzymatic activity the second the plant is picked, initiating a race against the clock which compromises the aroma fidelity the longer freshly harvested material sits before processing. Enzyme activity can destroy terpene quality quickly, and can even be so powerful that the plant material can start to compost and spontaneously combust when stacked onto itself. Loud Spectrum's one hour standard was set specifically to minimize that degradation before it begins. Flower is harvested at its peak terpene content, and extracted immediately for a true to strain final terpene product.

High Terpene Extract (HTE) is another similar product to CDT, the difference is it contains cannabinoids and is extracted from dried whole plant with butane. Some common issues with HTE is the inconsistency as well as off notes. Not only is the biomass extracted with butane which requires post processing to remove the butane, it is done with dried biomass which introduces off notes from decomposed terpenes. Inconsistency is a major factor with HTE, as the raw materials being processed for BHO may have been sitting for prolonged periods of time. Finished HTE products often vary from batch to batch with little to no consistency, unless done under strict quality control management. Post processing of the BHO during purging of the butane also causes terpene loss of the natural profile. Butane can also remain in the HTE product, which is out of compliance with most regulatory conditions. That being said, HTE can still be a desirable product, but it comes with its own unique set of problems with consistency and compliance.

Loud Spectrum has identified various decomposed byproducts of CDT's as well as off notes produced from the stem and leaf via olfactory GCMS. These decomposed byproducts of traditional CDT's have been

validated and verified compared to FDT, and are not found in FDT. The off notes can be produced either after harvest and before the biomass is processed, or during destructive processing resulting in decomposition during extraction. The spectra of Flower Derived Terpenes do not have the peaks and m/z associated with the decomposed CDT's. Various suppliers of CDT have been tested against Loud Spectrums FDT, and the problem of the off notes is consistent across all CDT's Loud Spectrum has tested. Coupled with the GCMS data, the off notes are analyzed with olfactory GCMS, which allows our flavor chemists to verify the off notes via one m/z compound at a time. Olfactory observation of decomposed m/z compound include hay and rancid aromas, and are not present in Loud Spectrums FDT.



Figure 2: *GCMS-Olfactory*

The FDT Standard: A Loud Spectrum Breakthrough

-Flower Only
-No Stem or Leaf
-Extraction Within One Hour of Harvest
-Customized Low Degradation Equipment IP

3. Engineering the Terpene Extraction: Purpose Built Customized Equipment

Meeting the "One Hour Flower Only Standard" at commercial scale is not achievable with off the shelf extraction equipment. Loud Spectrum, with its team of highly skilled chemists and engineers, understands the nuances of flower extraction, with over 10 years of terpene chemistry knowledge, and has succeeded in engineering a fully customized extraction system to overcome the downfalls of traditional CDT extraction.

Breakthrough Obstacles Overcome by Loud Spectrum

(1) Extract ONLY FRESH FLOWER.
(2) Extract within ONE HOUR of harvest.
(3) Minimize thermal and mechanical stress on fragile/volatile aroma compounds during extraction.
(4) Capture the full spectrum of the volatile profile in the flower, including the high impact minor and trace terpenes aroma compounds.

This specialized equipment and processing standard is what has set Loud Spectrum apart as the sole producer of true FDT. The standard is not simply a sourcing decision, but an engineering capability that no other company in the market has set Loud Spectrum apart as the sole producer of true FDT. The standard is not simply a sourcing decision, but an engineering capability that no other company in the market has replicated.



Figure 3: *FDT Extractor*

4. Market Validation: The ALIVE Cannabis Derived Terpene Line and the Reseller Pattern

Loud Spectrum brought FDT to market under its

Attribute	FDT - Flower Derived Terpenes	Traditional CDT	BDT - Botanically Derived Terpenes	HTE - High Terpene Extract
Source Material	Fresh cannabis flower only	Whole Plant Biomass: flower, leaf, stem	Non-cannabis botanical sources	Whole Plant Biomass: flower, leaf, stem
Time from harvest to extraction	Within one hour	Hours to months	Not applicable	Hours to months
Off-note Risk from leaf and stem	None	High	Not applicable	High
True to strain aroma fidelity	Highest	Variable	Approximated	Variable
Minor and trace terpene capture	Full Spectrum	Partial	Formulated	Partial
Post Processing required	Minimal	Often required	Blended to spec	Minimal
Producers in Market	Loud Spectrum	Many	Many	Many

Table 1: *Comparison between Different Terpene Categories: FDT, CDT, BDT, HTE.*

ALIVE product line, sold at a price that is competitive because customers are buying directly from the source rather than from a reseller. That vertically integrated relationship has not gone unnoticed elsewhere in the industry. For years other terpene suppliers have purchased Loud Spectrum's ALIVE FDT and repackaged it under their own brand names and classifying it as their own CDT product. Other companies are even known, in some cases, to blend their CDT with botanical terpenes without disclosing it to their customers, oftentimes labeling it as a true and authentic CDT terpene even when it is not. Purchasing from a trusted source is critical.

The identity of upstream terpene suppliers is typically not disclosed to end customers anywhere in the industry. Other terpene suppliers have found it more practical to purchase and rebrand Loud Spectrum's product than to replicate it. Loud Spectrum has built its FDT extraction infrastructure from the ground up, while other companies have gone on to purchase CDT extraction companies in an M&A style, as well as purchasing their CDT from other suppliers and rebranding them under their own product lines.

5. Conclusion: A New Standard for Cannabis Derived Terpenes

Flower Derived Terpenes (FDT) represent a standard Loud Spectrum has defined rather than adopted. Flower only, extracted within one hour of harvest, purpose built equipment designed around aroma preservation. Since introducing FDT under the Loud Spectrum ALIVE line in 2019, Loud Spectrum has remained the category's only manufacturer as a result of the difficulty to replicate the logistics and technology. The continued presence of Loud Spectrum's own FDT inside other companies' rebranded products, whether acknowledged or not, is in itself a form of confirmation. The standard Loud Spectrum set in 2019 remains unmatched and unrivaled.

About Loud Spectrum

Loud Spectrum, founded in 2015, originally under the name Medical Terpenes, was the first company to sell Botanically Derived Strain Specific Terpenes in 2015, the first to sell BDT that actually smell like cannabis with its breakthrough discovery of canna-sulfurs in 2018, and the first and only of its kind FDT in 2019. Loud Spectrum's HQ is based in Santa Ana, California, with the Research and Development and refinery/manufacturing in Irvine, California.