

KNOW YOUR GROW



THE CULTIVATORS GUIDE
TO IN-HOUSE POTENCY TESTING



SAGE
ANALYTICS

WHY IN-HOUSE TESTING IS SO IMPORTANT

In-house testing is a necessary part of quality manufacturing for all industries. It is separate from but related to the government-required compliance testing.

In-house testing is not considered compliance testing, because compliance testing requires an unbiased third party operator adhering to regulated standards, basically serving as a check or type of insurance for quality.

Compliance is often confused with in-house testing because in-house testing gives you the quality you need on a day-to-day basis to ensure that you always pass compliance testing. Commercial cannabis cultivation and manufacturing requires taking a natural and variable product and doing everything possible to make it into a regular branded product. Integrating the in-house testing supplied by Sage Analytics into your daily cannabis cultivation or manufacturing means “no more surprises” or in business terms, “risk mitigation”. This is true not only for harvest optimization or formulation of product, but also as risk mitigation for acquisition of raw material. Don’t be undervalued or taken advantage of at the negotiating table based on a single result that does not and simply cannot represent a large quantity of cannabis.

However, the stringent requirements of compliance testing could mean waiting over a week and paying \$500 dollars or more to mitigate risk. This precise, legally required measurement is not designed to help make decisions at the speed of business, it is designed to legally protect your customers and your business as you prove the quality that in-house testing gives you. Sage is here to help you keep your quality up every day while keeping costs down, upstream of any compliance testing.



5 THINGS TO KNOW ABOUT POTENCY TESTING

1 VARIOUS TOOLS ARE AVAILABLE FOR POTENCY TESTING

Potency testing usually happens in an accredited third-party lab, using high-performance liquid chromatography (HPLC) or gas chromatography (GC). The lab will divide a sample of cannabis bud or concentrate, dissolve it in a solvent, dilute it, heat it and pass it through separation columns and then into a detector. It is then compared to known chemical standards to measure potency. The process requires a qualified chemist to ensure that all factors are handled properly.

The benefit is—provided that it’s done properly—you’re comparing to a known standard and you can achieve extremely high accuracy and precision.

However, each lab has its own methods, which they consider intellectual property. Different labs may get different results based on their processes. State regulatory bodies, such as California’s Bureau of Cannabis Control, have refined rules to achieve consistency between labs, and the International Organization for Standardization (ISO) has a standard for analytical testing and quantifiable materials that is used to vet and qualify methods used at labs. Each lab also has an accreditation agency that audits their methods and chemists.

Working tightly with your lab as well as having in-house testing can help ensure that tests are both representative, and that everything is running smoothly on a day-to-day basis to minimize any changes in product output.



2 ON-SITE TESTING IS A MINIATURE INSURANCE POLICY

On-site testing will never replace traditional lab testing, as state regulations mandate that a third-party lab must test products and provide a certificate of authenticity (COA). However, testing in-house is a way for the business to protect itself and a good practice to implement into your business.

Inevitably if something does go wrong, it's like a mini insurance policy that says you did everything you could to make sure things went right. Especially because the legality of this industry is always in a constant state of flux, at the very least you want some paperwork and documentation, that shows you've been doing your best to keep things as safe as possible.



On-site testing also ensures that cultivators send compliant and representative samples to labs, since they can closely monitor potency levels during each stage of the cultivation process. Because you're testing often and in-house, you can deal with anything that might happen, right then and there. This will ensure that you make the best possible product to send off for laboratory testing to validate potency levels.

The ability to test in-house can also help cultivators make more educated business decisions. If a vendor claims a piece of equipment can improve a crop, a grower can test for potency regularly to see if the equipment is truly improving the potency levels. Or, if a cultivator buys seeds that are supposed to be CBD-only with no THC, he or she can test them to confirm the claim.

3 POTENCY TESTING SHOULD MEASURE THC AND CBD IN BOTH THEIR ACTIVE AND ACID FORMS

Most 3rd party potency tests measure the major cannabinoids, including the active forms of THC and CBD. However, cultivators should also test for the acid forms, THC-A and CBD-A. The acid forms are naturally produced by the plant and are more shelf-stable, but they don't have the effects that consumers usually seek, and therefore must be activated and turned into their active forms.

Activation occurs through a chemical process called decarboxylation, which is usually done through the heat of vaporization or smoking. During the extraction and manufacturing processes, there might be enough heat, pressure or chemical exposure that the cannabis could undergo decarboxylation and become active on its own, which is necessary when making edibles—otherwise, the end user would need to heat edibles before consuming them to get the desired effect.



4 TESTING OFTEN AND ON-SITE CAN HELP OPTIMIZE THE CROP

One of the key factors in the buying, selling and trading of cannabis has always been potency, and growers want to get the most potency they can from a crop, especially when investing in growing a difficult plant or a unique strain.

Cannabis cultivators are looking to optimize their potency in many ways. They care about their nutrients, sunlight, quality of the light that they're getting, and the night/day cycle. They are using instruments like the Beacon or Profiler II to test in-house during the grow cycle, so they don't have to send off to the lab in order to optimize their harvest. It allows them to pull a couple buds, and when the buds are close to their optimum potency, they are able to test every day before pulling down and harvesting a greenhouse or an acre of their outdoor grow.

Having the ability to test on-site on a regular basis helps cultivators optimize their harvest or breeding experiments, allowing them to test how potency is affected by nutrients, water, light and other factors and constantly improving upon procedures to increase potency. In addition, a lot of cannabis farmers are using testing as their in-house secret weapon to decide what is the best way to cultivate different strains in different ways to get their desired results.

5 ACCURATE POTENCY TESTING AND LABELING ENSURE PROPER DOSING

Potency levels are based on percent weight, and responsibly made edibles are subdivided with a milligram dose. For example, if a consumer purchases a chocolate bar, it is subdivided into sections and should be well-mixed, so the consumer can be confident that each section has a consistent dose.

When consuming flower, potency levels are equally important because they tell the consumer how much should be smoked to achieve the desired dose. Accurate potency testing and labeling on products also allows consumers to decide what an appropriate dose is because some people may have a high tolerance to cannabis or some patients may need more to deal with their medical conditions.

In many ways there's also an economic benefit for buy, sell and trade between cannabis companies because knowing this potency or percent weight allows you to know, "how much am I going to get back out of that if I extract it? How much do I have to put in something to make it an appropriate dose?"

Ultimately, this type of consistent product dosing allows you to build a trusted brand and customer loyalty because consumers know when they buy your product, their experience is going to be what they want and expect each and every time.



CALIFORNIA CULTIVATOR REVOLUTIONIZES GROWING TECHNIQUE WITH IN-HOUSE TESTING

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| GOAL: | Odoriferous, high-THC inflorescences |
| APPROACH: | Cannabinoid testing for genetic selection and information throughout the growing cycle |
| SURPRISES: | Unexpected cannabinoid profiles from familiar strains, Evolution of new growing practices, Cost savings |
| OUTCOME: | Higher-quality flower and lower labor costs |



Mission Nurseries in Patterson, California, strives to grow artisanal-quality marijuana at high production volumes. With 38,000 square feet of canopy and kosher standards to maintain, Mission balances its size with the uncompromising quality standards of its cannabis line, Mission Kosher.

It was the quest for the highest-quality marijuana that led Mission Nurseries' owner, Mitch Davis, to refine his genetics with in-house testing. But his experimentation led to some unexpected results, including big benefits to his growing technique.

“Before, our genetics and choice of mother plant would be based on physical structure — previous to our testing equipment. The color, the size,” explains Davis. “And unfortunately, it’s usually the biggest plant that wins with that method. We’ve learned the next smallest plant is often best based on the THC/CBD levels.”

Davis tests cannabinoids in-house using the portable Sage Analytics Beacon and sends samples to Phyllos Bioscience for genotype verification. “We’ve had situations when we send off for a genetic test and it comes back as Harlequin, so we know it’s Harlequin, but it tests at hardly any CBD.”

Davis chose to seek out another chemotype of Harlequin based on those test results, and he sent his unexpected samples to Steep Hill Labs to make sure his instrument was working properly. It was. He feels confident in Sage Analytics near-infrared spectroscopy technology because of repeated, direct comparisons to Steep Hill’s high-pressure liquid chromatography machine.



“We send our samples to Steep Hill out here in California and have gotten results always within a quarter percent of the Sage unit,” says Davis. “[The Sage Beacon] doesn’t do pesticides, but we don’t need that.”

While smaller testing units cannot test for contaminants like pesticides, near-infrared spectroscopy makes the benefits of strategic cannabinoid testing attainable — and easy. The Sage Beacon simply exposes crushed flower (or cannabis concentrate) to near-infrared light. The wavelengths of light that reflect back reveal the quantities of THC and CBD present in the sample. The process is quick — Davis reports 25-30 test runs in 90 minutes — and easy enough for Mission to use testing throughout the growing cycle.

And because California enforces a no plant-count limit, Mission Koshier simply grows more plants. “What we’ll do is put 1,600 [plants] in the greenhouse. I’m taking down a 30’x96’ greenhouse every week,” says Davis.

Because of the smaller plant size, Davis’ experimentation has led him to use progressively smaller growing containers. “We started out with twenty-fives in our greenhouse and then tens, and now we’re in 3-gallon containers for flower — actually like 2.7-gallon.” This method uses a third less soil, and it saves significant labor costs. Because Davis does not need to repot, he’s lessened his payroll expenses and streamlined his processes. Moving the plants is easier than it was with the 10-gallon containers too. With fewer personnel needed to repot and move plants, Mission Koshier is pleased to lessen its foot traffic — and reduce the pest infestations that come with it.

But the benefits of in-house testing have extended beyond Davis’ growing practices into its “crude oil” extraction operation as well. This allowed Mission Koshier to establish relationships with infused products manufacturers, including a national-recognized kombucha manufacturer starting a cannabis product line. Mission Koshier produces rosin-based gum arabic solutions and full-extract cannabis oil to service the needs of these edibles manufacturers, and the Sage Analytics Beacon helps pinpoint the concentrations requested by his clients to provide just-in-time distribution.

Whether using the Sage Analytics Beacon to assess chemotypes for genetics, refine growing processes or accurately formulate bulk concentrates, Davis is a testing convert. In summary of the new technology, Davis’ conclusion is simple: “It’s paid for itself many times over.”



The **BEACON**
SAGE ANALYTICS

IN-HOUSE ACCURACY?

THC/CBD PERCENTAGES



“We have always gotten results within a quarter percent.”

-Mitch Davis

“We’ve done THC testing of different-sized plants, and what we’ve found is additional growth time — to get a bigger plant to improve yield — actually costs you THC and ‘nose.’ As the structure gets above a certain size, it grows more wood than flower.

You’re losing some of the energy of the plant going into the structure,” says Davis. “So we’ve changed our growing methodology by using testing.”

Thus, with the goal of high THC percentages for an excellent aroma, Davis has chosen to veg his plants for a shorter period of time. By harvesting smaller plants, he maximizes quality.



IN-HOUSE POTENCY TESTING ADVANTAGES

Growers can get results
that are within a couple percent
of lab results.

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The sample is not destroyed
in the process.

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You can perform
hundreds of tests and it doesn't
cost you anything.

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You don't have the standards,
you don't have the chemicals,
and you don't have to
pay a chemist.

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It's simple enough to use
that anyone in your organization
can run tests.



For more information on Sage Analytics Potency Profilers, visit
www.sageanalytics.com or call 650-492-8500