

THE
**RESEARCH
CENTER**

CONDUCTED BY



REPLACING **MYTHS** WITH **DATA**



**What Cannabis Growers
Need to Know About Airflow**



Why Airflow Has Always Been the Great Unknown...

For decades, **airflow** has been one of the most debated and least measured variables in indoor cannabis cultivation.

Ask ten growers how much airflow they run, and you'll get ten different answers. Most of them will be based on:

- Habit
- Intuition
- What they were taught years ago
- Or the classic test: "Are the leaves dancing?"

But until now, there has been no cannabis-specific data to validate these decisions.

That's why **Pipp** partnered with **Dr. Allison Justice** and the **Cannabis Research Center & Coalition** (CRC) to replace assumptions with real data and establish measurable benchmarks for airflow in controlled environments.



This research was designed to answer one simple question:

**"DOES AIRFLOW
CHANGE HOW CANNABIS
GROWS, IF SO... WHEN,
HOW, & WHY?"**



OUR GOALS

Why This Research Exists

This project represents the **first controlled, replicated airflow trial** of its kind in the cannabis industry.

To eliminate the variables that usually cloud cultivation research, Pipp and the CRC built a **dedicated research facility** featuring:

- Three identical flower rooms
- Tight environmental control (VPD, temperature, and humidity held constant)
- Repeated trials across multiple years

This research is public, not proprietary, because better data leads to better facilities, better systems, and better outcomes for everyone.



Quantify how airflow velocity impacts plant growth, yield, & quality.



Identify thresholds where airflow begins to matter.



Reduce variability & operational risk.



Provide real, data-backed benchmarks for facility design.



Share the findings openly with the industry.

TRIAL #1

Testing the Industry Standard

The first trial focused on what most facilities consider best practice for normal airflow:

Treatment	Target Velocity
Near-Zero Airflow	Environment homogenized, no targeted velocity
Medium Airflow	~100 FPM
High Airflow	~200 FPM

What Happened? Surprisingly, nothing significant. Across these treatments, researchers found:

- No significant differences in yield
- No meaningful differences in plant height
- No major visual differences in flower quality

Visually, chemically, and quantitatively, the plants looked remarkably similar.

This raised a critical question: **Are growers operating below the threshold where airflow drives change?**



TRIAL #1
The Results



Low Velocity



Medium Velocity



High Velocity

TRIAL #2

Pushing Past the Threshold

To find out, the second trial intentionally increased airflow:

Treatment	Target Velocity
Low Airflow	0 FPM
Medium Airflow	~200 FPM
High Airflow	400 FPM

Note: This dataset includes one replicate. A second is underway to strengthen statistical confidence.

**THIS IS WHERE
THE STORY
CHANGED...**

TRIAL #2

Aiflow & Plant Height

The Result No One Saw Coming...

Conventional wisdom says that higher airflow mechanically stresses plants and keeps them shorter.

The data showed the opposite.

The plants exposed to higher airflows were:

- Taller
- Faster growing
- More vigorous during early flower

By the end of stretch, plants in the highest airflow treatment were approximately **6 inches taller** than those with no targeted airflow.

Just as importantly, the study confirmed what many growers observe anecdotally:

Nearly 90% of vertical growth is complete by the end of week three of flower.



**AIRFLOW DIDN'T CHANGE
WHEN PLANTS STRETCHED, IT CHANGED
HOW EFFECTIVELY THEY GREW DURING
THAT WINDOW.**



TRIAL #2

Plant Physiology:

What the Leaves Were Really Telling Us...


Visual assessments revealed clear **physiological differences**.

These weren't cosmetic changes. They reflected **fundamentally different plant responses** to the same environment, driven by airflow alone.

LOW-AIRFLOW PLANTS SHOWED:

- Redder stems
- Higher anthocyanin expression
- Stress responses easily mistaken for nutrient deficiencies

HIGH-AIRFLOW PLANTS APPEARED:

- More balanced
 - More uniform
 - Less stressed overall
- 

TRIAL #2

The 200 FPM Threshold

One of the most important findings was that:

BELOW ~200 FPM

Airflow had limited measurable impact.

ABOVE ~200 FPM

Differences became clear and consistent.

This explains why airflow has remained misunderstood for so long. Many facilities believe they are hitting **100 - 200 FPM**, but in reality...

- Airflow is uneven
- Highly positional
- Rarely measured
- Often inconsistent

**TO SEE REAL RESULTS,
AIRFLOW MUST BE:**

- Measured
- Consistent
- Uniform across the entire canopy



TRIAL #2

Yield, Biomass, & Energy Allocation

When positional bias was removed, yield trends became clear:

Compared to no airflow:

- Medium and high airflow treatments produced significantly higher fresh and dry flower weight
- Yield increased as airflow increased, up to the tested limit

But the most interesting finding wasn't yield, it was **efficiency**.

STEM-TO-FLOWER EFFICIENCY

The medium airflow treatment results showed...

- Lower stem biomass
- More energy directed into flowers

In simple terms: More of the plant's resources went into what growers actually sell.

This raises new questions for **future trials:**

- Is there an airflow "sweet spot"?
- Do cultivars respond differently?
- Can airflow be tuned to maximize flower over structure?

TRIAL #2

Position Matters

Why Uniform Airflow Is Non-Negotiable

Even in a carefully engineered room, researchers observed **positional bias**:

- Plants closest to airflow sources experienced different velocities
- The first 1–2 feet of each row behaved differently

To isolate true effects, researchers had to exclude the **first two rows** from certain analyses.

THE COMMERCIAL TAKEAWAY

If airflow isn't uniform, neither is your crop. Random fans blasting a section of canopy doesn't improve airflow, it creates **variability**.



TRIAL #2

Trim Percentage

A Hidden Labor & Profit Win

One of the most unexpected results:

- No airflow: ~42% trim
- Higher airflow: significantly lower trim percentages

Lower trim means:

- Less labor
- Faster processing
- Higher sellable yield

**AIRFLOW DIDN'T JUST
CHANGE HOW PLANTS
GREW, IT CHANGED HOW
EFFICIENTLY THEY
COULD BE PROCESSED.**

What This Means for Growers?



This research doesn't say "more airflow is always better." Instead, **it proves that...**

- Airflow matters far more than previously quantified
- There is a real, measurable threshold
- Consistency is just as important as velocity
- Poor airflow design creates variability, not resilience

Most importantly: Cannabis airflow can and should be engineered using data, not folklore.



Thank You for Your Support!


A special thanks to the **CRC** and all of our **trusted partners** for making The Research Center and these airflow studies possible.



OUR TRUSTED PARTNERS:



Contact **Pipp Horticulture's** experienced team of indoor cannabis operators and designers to take the first step towards your vertical farming future!

 (616) 988-4044

 info@pipphorticulture.com

 pipphorticulture.com

