



ANALYSIS OF
BOVEDA TERPENE STUDY

DATA GENERATED BY
EXCELSIOR ANALYTICAL LABS

NOVEMBER 4, 2015

Trichome Study Results

11-4-2015

BACKGROUND

Boveda is the developer of the only patented two-way moisture management system that can totally control the atmosphere surrounding a product in a closed container. In business for 18 years, they currently supply many markets including tobacco, pet foods, electronics, musical instruments plus the rapidly developing cannabis marketplace. Because of the restrictions placed on marijuana distribution, we had been unable to undertake our own in-house testing in Minnesota. We thus engaged Excelsior Analytical Labs, a licensed and bonded facility in Union City, CA which focuses on cannabis testing to perform testing for Boveda.

The test design involved placing the “Girl Scout Cookie” strain of cannabis product in a sealed 16 ounce glass mason jar with and without a Boveda 62% 8 gram pouch inside. Test length was 6 weeks. These jars were gently shaken each week to simulate the action that might happen within a processing facility vs. simply sitting pristinely on a shelf. We wished to measure the impact of gentle handling on trichome level and hence the terpene and cannabinoid level in the bud.

The terpenes were measured using gas chromatography and the cannabinoids using liquid chromatography. A control sample of shaken buds (9.33% moisture) was compared with a sample of the same buds stored with an 8 gram 62% RH pouch (10.2% moisture).

TEST RESULTS SUMMARY

At the conclusion of the 6 week test, the products were analyzed for various terpenes and cannabinoids as a measure of the trichome level. The laboratory compared the performance of the product protected with a Boveda 62% pouch to the same product sealed in the jars without any Boveda as the control. The results showed:

THE LEVELS OF TERPENES AND CANNABINOIDS PRESENT IN THE BUDS PROTECTED WITH BOVEDA 62 WERE APPROXIMATELY 15% HIGHER THAN THE MEASURED LEVELS WITHOUT BOVEDA 62 PRESENT AT THE END OF 6 WEEKS

The positive results when Boveda 62 was present, demonstrated that the higher level of moisture in the atmosphere and thus the impact on the product resulted in improved retention of the trichomes. It is well recognized that trichomes contain the vast majority of cannabis terpenes and cannabinoids. This test demonstrated the protective effect of the Boveda 62 pouch on cannabis quality and efficacy.

DISCUSSION

Analysis of the moisture measurement data showed that when simply storing the product in a tightly sealed container without the Boveda pouch, the product moisture still dropped from its starting point. The product stored with Boveda pouch increased from its initial moisture level and reached an equilibrium point with the Boveda 62% product. The result was a significantly higher level of terpenes and cannabinoids retained for the user.

This test was run for only 6 weeks. It can be assumed that the differences between the samples with and without Boveda will continue over additional time and the spread between the numbers will grow. This will potentially show an even greater advantage to protection of the product with a moisture management system.

Another study is currently underway to determine how Boveda formulas containing an integrated oxygen scavenger will perform over a longer term. We expect less oxygen to mean even more terpene retention.

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EXCELSIOR ANALYTICAL TEST RESULTS
TERPENOID DATA 8-3-2015

Date	ID#	Sample name	Type	Weight (g)	Moisture %	beta-pinene	beta-myrcene	limonene	linalool	beta-caryophyllene
6/18/2015	1506Ea104	Initial results	flower	1.007	9.33	0.47	1.31	2.59	1.00	6.31
7/30/2015	1507Ea236	Control--no Boveda	flower	1.002	8.52	0.00	0.69	1.14	0.67	5.92
7/30/2015	1507Ea239	With Boveda 62	flower	1.002	10.19	0.00	0.71	1.61	0.89	6.42
					Boveda 62 vs. control	-	+3%	+41%	+33%	+8%
Date	ID#	Sample name	Type	Weight (g)	Moisture %	alpha-humulene	valencene	cis-nerolidol	alpha-bisabolol	unknown-terpenoids
6/18/2015	1506Ea104	Initial results	flower	1.007	9.33	2.91	0.46	1.90	0.00	5.72
7/30/2015	1507Ea236	Control-no Boveda	flower	1.002	8.52	2.71	0.43	1.98	0.00	4.28
7/30/2015	1507Ea239	With Boveda 62	flower	1.002	10.19	2.96	0.47	2.10	0.00	5.86
					Boveda 62 vs. control	+9%	+9%	+6%	-	+37%
<u>Increase in terpenoids when Boveda pouch present vs none @ 6 weeks</u>						<u>Loss in terpenoids from initial sample</u>				
Avg. 18%						Without Boveda 62 Lost Avg.22%				
(Average of percent change on individual readings)						With Boveda 62 Lost Avg. 12%				
Units are mg/g of cannabis						(Average of percent change on individual readings)				
RLE 11-4-2015										

