

HOP QUALITY REPORT CERTIFICATE OF ANALYSIS



To: Hop Alliance

Sample ID: Amarillo

Variety: Amarillo®

Product: T-90 Pellet

Date : 11/3/2023

Certifying Officer: Zach Lilla - Lab Manager
 TTB Certified Chemist - Member AOAC - ASBC - BJCP

<u>Method</u>			
Hops-4C	Moisture Analysis	% Moisture	10.5
		% Dry Matter	89.5
AAR	Xanthohumol by HPLC		NT mg/g
Hops-12	Hop Storage Index	HSI	0.318
Hops-13	Essential Oil by Steam Distillation	mL/100g	1.84
Hops-14	Alpha and Beta Acids by HPLC	Cohumulone	22.8 (% of Total AA)
ICE-3		% Alpha Acids	8.01
		Colupulone	41.4 (% of Total BA)
		% Beta Acids	5.56
		a/b ratio	1.44
Hops-17	Hop Essential Oil by GC-FID (as is)	% area	mg/100g
		B-Pinene	0.91 14.59
		Myrcene	52.13 948.28
		Linalool	0.67 12.69
		Caryophyllene	6.63 110.68
		Farnesene	6.01 123.77
		Humulene	16.74 277.32
		Geraniol	0.22 4.17

NT=NOT TESTED

Signed:

Zachary Lilla - Lab Manager - TTB Certified Chemist
 AAR LAB - ADVANCED ANALYTICAL RESEARCH
 2517 Advance Rd Ste. A Madison WI 53718



AROMA QUALITY (AQ)

HOP QUALITY REPORT



Customer : Hop Alliance

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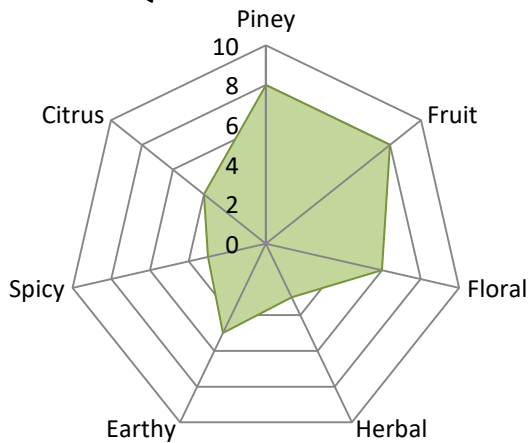
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	Typical Range	
% Moisture <input type="text" value="10.5"/>	8 - 12 %	<input checked="" type="checkbox"/>
HOP QUALITY (adjusted to 10% moisture)		
Total Oil ml/100g <input type="text" value="1.85"/>	1.0 - 2.3 mL	<input checked="" type="checkbox"/>
cohumulone <input type="text" value="22.8"/>	20 - 24%	<input checked="" type="checkbox"/>
Alpha Acids <input type="text" value="8.05"/>	7.0 - 11%	<input checked="" type="checkbox"/>
Beta Acids <input type="text" value="5.59"/>	5.5 - 8.0%	<input checked="" type="checkbox"/>
Myrcene <input type="text" value="52.13"/>	40.00 - 50.00 %	<input type="checkbox" value="↑"/>

AROMA QUALITY (AQ)

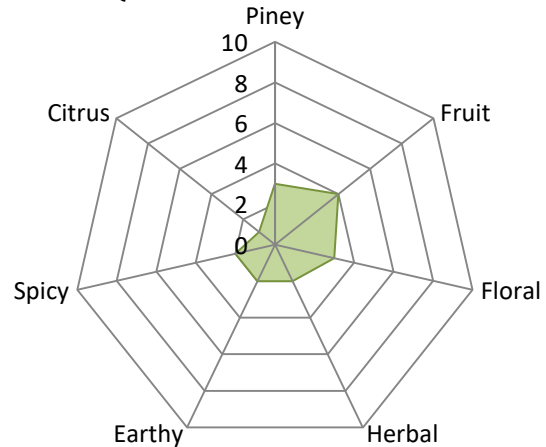
	% Area		mg/mL of Hop Oil			mg/100g of Hops (@10%H2O)			
B-Pinene	0.91	0.40 - 0.80 %	↑	7.92	4 - 8	✓	14.67	4 - 18.4	✓
Myrcene	52.13	40.00 - 50.00 %	↑	514.72	400 - 500	↑	953.25	400 - 1150	✓
Linalool	0.67	0.50 - 0.80 %	✓	6.89	5 - 8	✓	12.76	5 - 18.4	✓
Caryophyllene	6.63	7.00 - 10.00 %	↓	60.08	70 - 100	↓	111.26	70 - 230	✓
Farnesene	6.01	6.00 - 9.00 %	✓	67.18	60 - 90	✓	124.42	60 - 207	✓
Humulene	16.74	19.00 - 24.00 %	↓	150.53	190 - 240	↓	278.77	190 - 552	✓
Geraniol	0.22	0.01 - 0.50 %	✓	2.27	0.1 - 5	✓	4.20	0.1 - 11.5	✓

AQ vs VARIETY SPECS



Aroma Intensity= 29

AQ vs ALL HOP VARIETIES



Aroma Intensity= 6

Signed: _____

Zachary Lilla - Lab Manager - TTB Certified Chemist

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608-622-7522

COMPREHENSIVE HOP PROFILE CERTIFICATE OF ANALYSIS



Customer : Hop Alliance

Sample ID: Amarillo

Variety: Amarillo®

Product: T-90 Pellet

Date : 11/3/2023



Certifying Officer: Zach Lilla - Lab Manager

TTB Certified Chemist - Member AOAC - ASBC - BJCP

Hops-17	Hop Essential Oil by GC-FID (Expanded Profile) as a % of total oil	(10% moisture)		(as is)
		mg/100g	%Area	mg/100g
	alpha pinene	0.00	0.00	0.00
	isobutyl isobutyrate	1.10	0.05	1.10
	beta pinene	14.67	0.91	14.59
	myrcene	953.25	52.13	948.28
	2-methylbutyl propanoate	1.87	0.09	1.86
	limonene	7.54	0.36	7.50
	2-methylbutyl 2-methylpropanoate	5.69	0.28	5.66
	phellandrene	4.58	0.22	4.55
	ocimene	1.36	0.07	1.35
	2-methylbutyl 2-methylbutanoate	0.68	0.03	0.67
	methyl heptanoate	0.99	0.05	0.98
	2-methylbutyl 3-methylbutanoate	1.95	0.09	1.94
	methyl 6-methylheptanoate	1.33	0.06	1.33
	methyl octanoate	2.70	0.13	2.68
	methanethiol caproate	0.68	0.03	0.67
	perillen	4.02	0.18	3.99
	methyl 6-methyloctanoate	0.60	0.03	0.60
	ylangene	2.84	0.14	2.82
	copaene	3.96	0.19	3.94
	linalool	12.76	0.67	12.69
	b-ylangene	1.40	0.07	1.39
	caryophyllene	111.26	6.63	110.68
	methyl-4-decanoate	10.63	0.51	10.57
	farnesene	124.42	6.01	123.77
	a humulene	278.77	16.74	277.32
	y-murolene	12.52	0.60	12.45
	b-selinene	8.56	0.41	8.52
	a-selinene	10.64	0.51	10.58
	cadinene	35.52	1.72	35.34
	selina-3,7(11)-diene	11.38	0.55	11.32
	elemene	1.42	0.07	1.41
	geraniol	4.20	0.22	4.17
			Total =	1624.74

Oil Composition % Area	Oil Composition mg/mL	mg/100g @ 10%
esters, 1.363, 2%	esters, 15.2, 2%	esters, 28.2
sesquiterpenes, 33.637, 37%	sesquiterpenes, 325.4, 37%	sesquiterpenes, 602.7
monoterpenes, 54.755, 61%	monoterpenes, 541.2, 61%	monoterpenes, 1002.4

Signed:

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