HOP QUALITY
From the Field to the Brewer

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Topics to be Covered

- US hops vs other Countries
- Quality on the Farm
- Insects and Disease
- Inspection and Receiving Hops
- Hop Evaluation by the Brewer
- Question and Answers

Statistical Overview

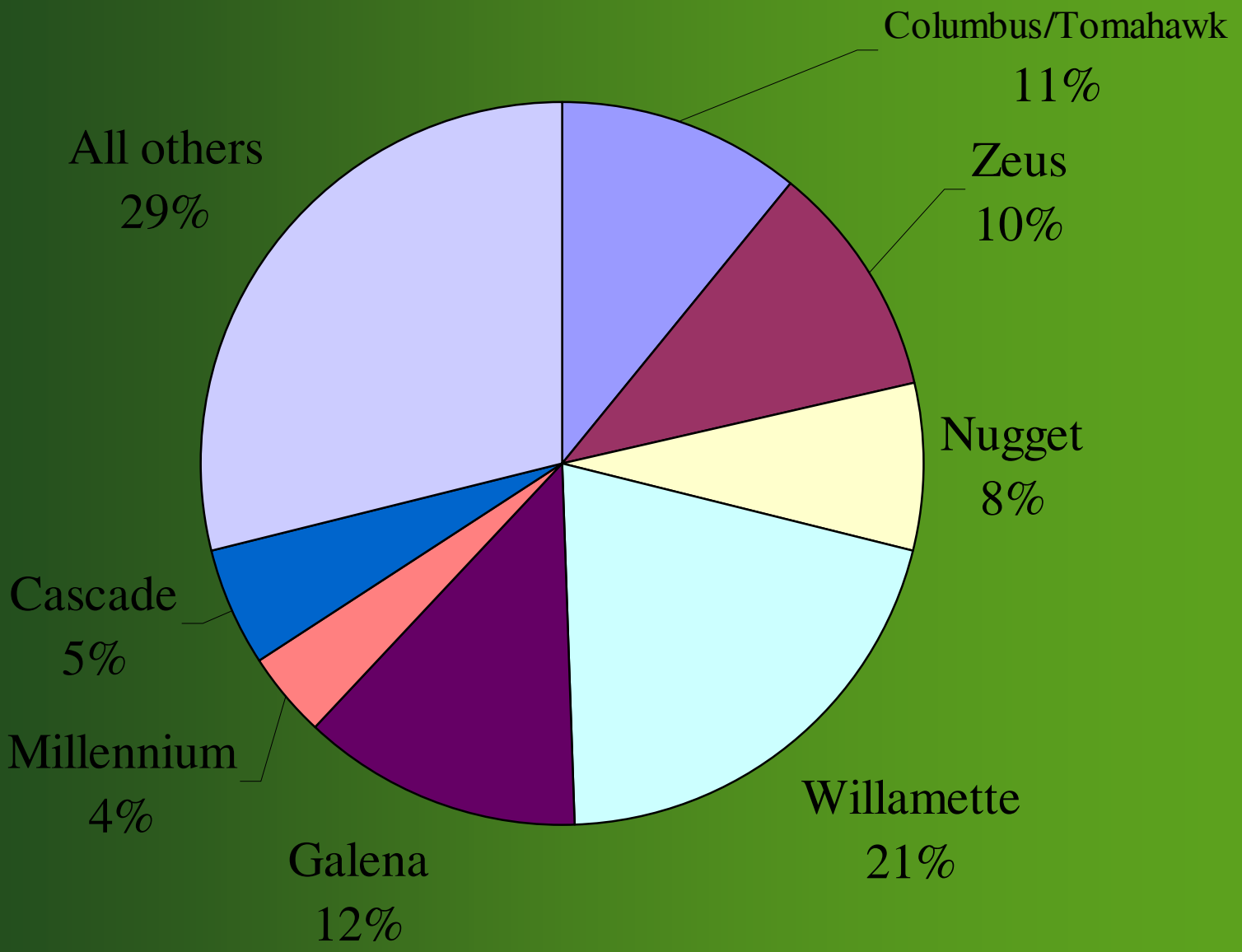
	1994	2004	Change 94/2004	% Change 94/2004
HOP PRODUCTION (POUNDS)				
United States	74,560,000	55,203,900	-19,356,100	-25.96%
Germany	62,687,000	73,854,000	11,167,000	+17.81%
World	262,056,000	203,259,100	-58,796,900	-22.44%
IHGC AROMA ACREAGE				
United States	16,388	11,411	-4,977	-30.37%
Germany	33,509	23,122	-10,387	-31.00%
World	112,541	62,312	-50,229	-44.63%
IHGC ALPHA ACREAGE				
United States	26,005	16,608	-9,397	-36.14%
Germany	20,640	18,276	-2,364	-11.45%
World	65,319	56,229	-9,090	-13.92%
IHGC TOTAL HOP ACREAGE				
United States	42,405	28,020	-14,385	-33.92%
Germany	54,148	43,168	-10,980	-20.28%
World	177,859	119,943	-57,916	-32.56%
ALPHA ACID PRODUCTION (POUNDS)				
United States	8,558,257	6,393,000	-2,165,257	-25.30%
Germany	2,610,246	6,426,000	3,815,754	+146.18%
World	20,513,803	17,945,444	-2,568,359	-12.52%
BEER PRODUCTION (Million HL)				
United States	202.1	238	36	+17.76%
China	119.3	277	158	+132.19%
World	1041.2	1545.3	504	+48.42%

2004 WORLD HOP ACREAGE AND PRODUCTION

	HOP ACREAGE (acres)				HOP PRODUCTION (pounds)			
COUNTRY	AROMA	ALPHA	TOTAL	NEW	AROMA	ALPHA	TOTAL	Alpha MT.
Australia	7	1,317	1,323	0	4,400	3,146,000	3,150,400	174
Belgium	86	393	487	7	99,200	771,600	870,800	34.2
Bulgaria	178	368	546	0	216,100	496,000	712,100	32.6
China	464	11,234	11,697	0	661,400	25,220,600	25,882,000	759
Czech Rep.	13,227	506	14,420	687	13,117,400	771,600	13,889,000	250
Germany	23,122	18,276	43,168	1,771	39,682.800	34,171,300	73,854,100	2915
France	1,717	91	1,944	136	2,444,900	130,100	2,577,200	30.5
New Zealand	635	408	1,042	0	989,900	756,200	1,746,500	64.5
Poland	2,193	3,285	5,478	0	2,645,500	3,527,400	6,172,900	185.75
Portugal	0	91	91	0	0.0	125,700	125,700	5.5
Russia	748	524	1,370	99	381,400	368,200	749,600	17
Slovakia	865	0	865	0	776.000	0	776,000	14
Slovenia	3,623	227	3,982	131	4,563,500	698,900	5,262,400	204
Spain	0	1,680	1,680	0	0.0	3,115,100	3,115,100	153.7
UK - England	2,043	1,237	3,354	74	1,995,200	1,530,000	3,525,200	208
Ukraine	1,882	1,218	3,616	516	1,713,000	1,086,900	2,799,800	59.5
USA	11,411	16,608	28,020	0	16,732,900	38,805,400	55,538,300	2900
Serbia - Montenegro	116	491	607	0	186,000	398,000	584,000	12.1
South Africa	0	1,242	1,242	0	0.0	2,198,000	2,198,000	121
2004 IHGC Totals	62,318	56,229	119,943	3,421	45,791,259	117,317,000	203,529,100	8,140.35

SOURCE: November 2004 IHGC Report. Some errors were corrected during preparation of this report. Numbers may not total exactly due to rounding and standard/metric conversions.

Seven Most Widely Planted Varieties and the Percentage of Total Acreage They Represent



There are many things it takes to be a great hop grower

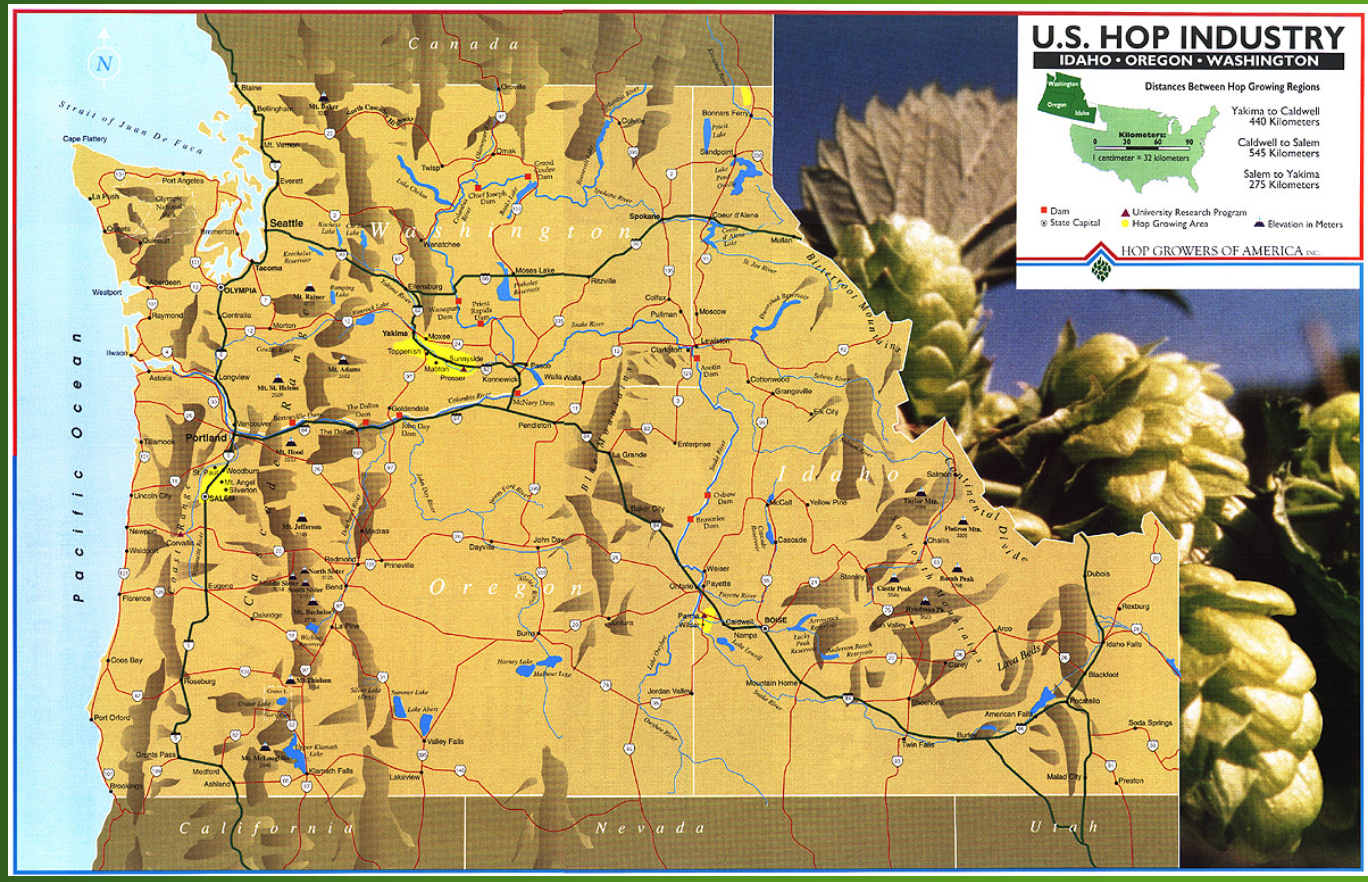
Grower

A. Some people are just better at growing. Pay more attention, better growing habits or intuition

B. Have good management employees

C. Well trained and observant field men that can help with chemical and fertilizing needs

Land



A. Good Soil

B. Proper Drainage

C. Latitude 34 - 50°

D. Chemically Stable

E. Fumigation

F. Environment

Good Rootstock

A. Virus free material vs. buying from neighbor
B. Proper cultivars in rootstock vs. mixed or incorrectly labeled
C. Proper digging out of old material and using offset

Good Rootstock and Planting cont.

D. Proper Spacing

E. Taking good care of hop hills- Don’t cut too much, keep neat and trim

F. Replant as needed

Trellis

A. Stable structure that hopefully won't fall down

Trellis continued

B. Factors that work against a trellis would be weight of the hops, wind and rain

C. Keep area around trellis clean and dust free

D. Have a proper maintenance program

Maintenance of Fields

A. Keeping weeds to a minimum vs. cost
B. Proper watering
    1. Furrow vs. drip
    2. Having enough water or too much
C. Timing of using fertilizers, pesticides, insecticides

Maintenance of Fields cont.

D. Cutting back hops & training for even and various maturing dates

E. Having varieties that mature at different times-small window

F. Weather conditions throughout the year and ability to adjust

G. Chemical or other means to keep bottom leaves minimized

Summary of the Farm

A. Problems can happen throughout the year.
   1. Some can, and should, be taken care of by the growers as a normal course of business.
   2. Others are beyond the grower's control. Mainly the elements of disease & pests associated by same elements

Summary of the Farm cont.

B. Keep in mind, hops must hang out all summer, and all fields will show some signs of damage as a result
C. Even the best hops can be damaged at picking time by picking in the rain, improper drying and cooling, sending in hops improperly

U.S. vs. Rest of the World

A. General problems with land, rootstock, trellis, maintenance, etc. are universal
B. There are some differences between US and World
C. How hops are watered in Europe
    1. Most growers rely on rainfall and affects of no rain
D. US compared to the major producers i.e. Germany & UK are much larger farmers
    1. As a result they have bigger & better picking facilities that make for overall cleaner picked hops

U.S. vs. Rest of the World cont.

E. Europe starting to do more with cold storage. Mainly for high alpha hops

F. Aroma hops are dried differently in Europe

   1. 12 – 14% moisture and then re-dried down
   2. Packed in loose pockets

G. Stored in common facilities

H. What has been perceived as differences in aroma or quality from US vs. Germany – Cold vs. common

Diseases and Pests

Common Flaws - Insect Damage

Hop Aphid

A. Suck life out of cone.
B. Leave waste and die.
C. Like cool weather.
D. Early in growing season.
E. Honeydew.

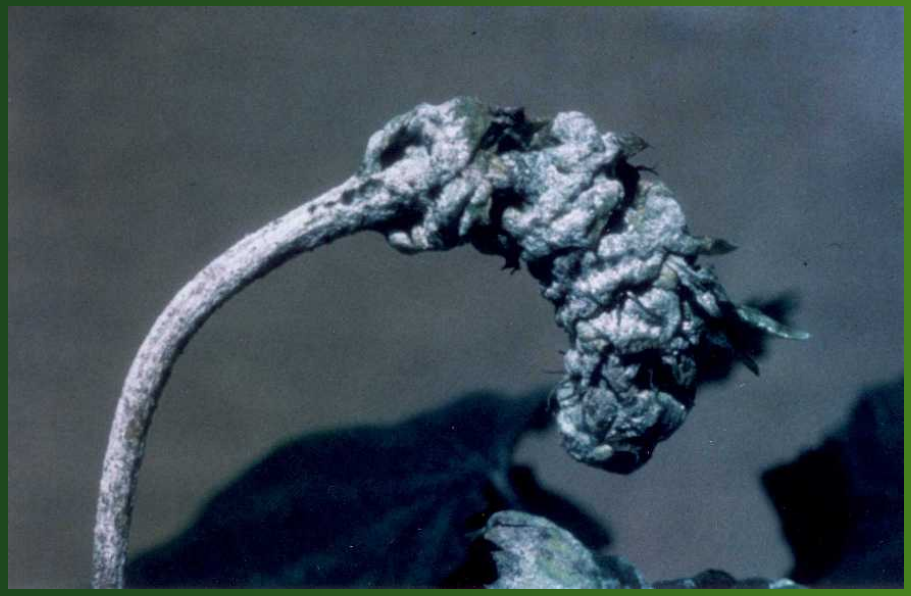
Black Mold from Aphid

Common Flaws- Insect damage

Spider Mite

A. Feed on juice. Give cones a reddish tinge.
B. Whole cone effected.
C. Appear in late summer as cones are ripening.
D. Warm weather

Common Flaws



Mildews

A. Downy

B. Powdery

Common Flaws

Windburn and Sprayburn

A. Brown discoloration
B. Wind- natural or fan
C. Bump and bruise
D. Chemicals
E. Cosmetic flaw

Disease Resistance

Picking

A. Finding optimum maturity – immature vs. over-mature
B. Weather conditions at harvest
    1. Picking hops in the rain vs. sun
    2. Tarnishing of hops

C. Night picking vs. day picking
    1. How hops come off at different temperatures and how time after being picked affects how easy they come off
D. How the picker is set up for picking
    1. How clean to pick Dribble belts & re-cleaners

Drying or Kilning

A. Temperature of kiln and air flow 140° - 150°
B. Climate outside during drying process
C. Hops picked in rainy conditions affected by humidity and water droplets on the cones.
D. How hops are normally 75% moisture and dried to 8 – 10%, but can tarnish being picked in the rain.
E. Depth of kiln is important, stirring over-dried hops and under-dried hops
F. Hops are not all dried equally in a kiln

Cooling

A. Want to cool 24 hrs before baling
B. Going through a sweat
C. Why hops are mixed well before baling
D. Pockets of moisture are bad for quality and can be dangerous
E. Fire danger in hops

Baling

A. Not too much oil in the bale chute
B. Burlap vs. plastic
C. Used burlap vs. new

Delivery to Dealer

A. Rainy days- hauling is affected by water on bales from rain & road spray. Using vans

B. Smoke stacks of trucks

C. Dropping bales off of trucks

D. Letting hops sit on a truck too long in Ambient temperatures

Inspection at Warehouse

A. Testing for moisture with a tryer and meter

Inspection at Warehouse cont.

B. Evaluating a tryer sample

Inspection at Warehouse cont.

C. Testing for moisture with a tryer and meter

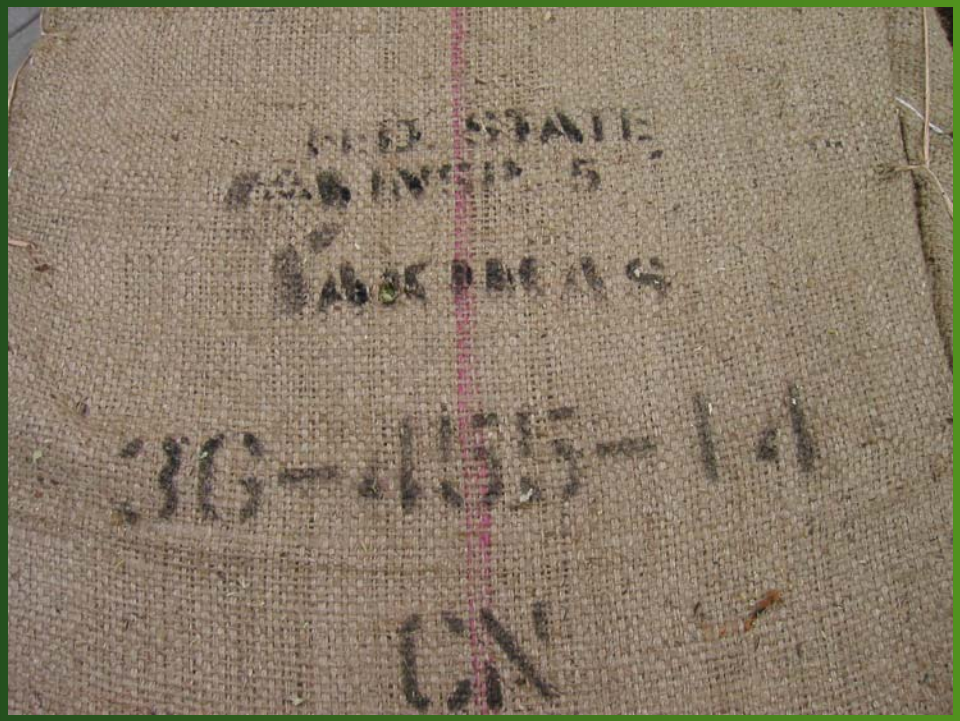
Inspection at Warehouse cont.

D. Weighing hop bales

Inspection at Warehouse cont.

E. Physical characteristics
F. Aroma

Inspection at Warehouse cont.



G. State inspection for leaf/stem & seed

Inspection at Warehouse cont.

H. Chemical analysis

Inspection at Warehouse cont.

I. Taking care of problem bales
J. Proper refrigeration
K. Good air flow

Hop Selection Team

Brewers Cut

A. Every 50th bale in lot
B. Alpha, Beta, and HSI.
C. Dept of Agriculture- Leaf and Stem. Every 10 bales.
D. Seed count. Variety.
E. Percentage of weight.

High Leaf and Stem

Hop Evaluation Descriptors

Positive:

A. Forest-woody- resinous-piney, Mint, Fruity-citrus- grapefruit,lemon,orange, Spicy, herbal-oregano, Grassy(fresh), Floral- geranium, rose, Pineapple

Negative

A. Earthy, Grassy(brown), Musty, Kerosene(kiln), Hay- straw, Tea, Oxidized- cheesy, Fishy,Smoky,Waxy

Hand Evaluation of Hops

Selection Order

A. Start with aroma varieties moving to super alphas.
B. Take short breaks between varieties.
C. Wash hands? Up to brewer
D. Get yearly update from supplier before starting. Tips on good and bad trends.
E. Create evaluation form and process.

The Main Question

"Is the look, aroma and feel right for this variety?"

Examine sides of the brewers cut

A. Examine cut and un-cut sides.
B. Cone stability.
C. Examine lupulin for oxidation. Light orange.
D. Rub cut side for seeds.
E. Any leaf / stem ?

Feel for Moisture

A. Press down on sample
B. Harder means more moisture - boardy.
C. Should have nice spring when pressed.
D. Low moisture shatters when pressed - late harvesting. Lower alpha.

Inspect Whole Cones

A. Cut off 2 inches.
B. Examine for windburn or Sprayburn. Flaws.
C. Cone sizing- variety.
D. Check strig- proper drying.
E. Whole vs. broken cones.
F. Lupulin glands.

Assess the Hop Color

Whole Cone Aroma

A. When cones are unbroken, it is easier to spot off aromas from the kiln or other process related defects.

First rub - The light one

A. Take sample, rub and set aside. Rinse hands.
B. Take another sample and lightly break apart the lupulin glands.
C. Smell. This rub is a good way to look for grassy aromas.

Big Rub- Release the Aroma

A. Take light rub sample and crush in your hands. Fall apart.
B. Releases hydrocarbons.
C. Feel for moisture and oils.
D. Big smell. Do you like it?

Big Rub - Hold it

A. Hold sample in hand to let warm up.
B. Take another smell.
C. How do you like it now?
D. Repeat First and big rub with fresh sample.

Successful Rub

Discuss with team

A. Discuss after each variety.
B. True to type?
C. Performance in brewery.
D. Repeatability in your beers. Year to year.

Sampling Steps

1. Examine sides of the cut.
2. Feel for moisture.
3. Inspect whole cones.
4. Assess the hops color.
5. Whole cone evaluation
6. Light rub.
7. Big rub.
8. Big rub - hold.
9. Discuss the rub.

Choose your Lots

Further Evaluation

A. Hop teas.

B. Evaluate in plant.

Conclusions

A. Learn to identify the flaws in hops and how they can effect your beer.
B. Know the aroma, feel and appearance of your most used varieties.
C. Develop your aroma vocabulary. Tune your sense of smell as well as your tasting palate.
D. Establish a team to make your selections.

Conclusions cont.

E. Create process for evaluation. Establish guidelines and follow for each sample. Create evaluation form.
F. Select for consistency. Quality beer.
G. Develop strong relationship with suppliers.

The Main Question

“Is the look, aroma and feel right for this variety?”

Happy Rubbing

Thank you!!