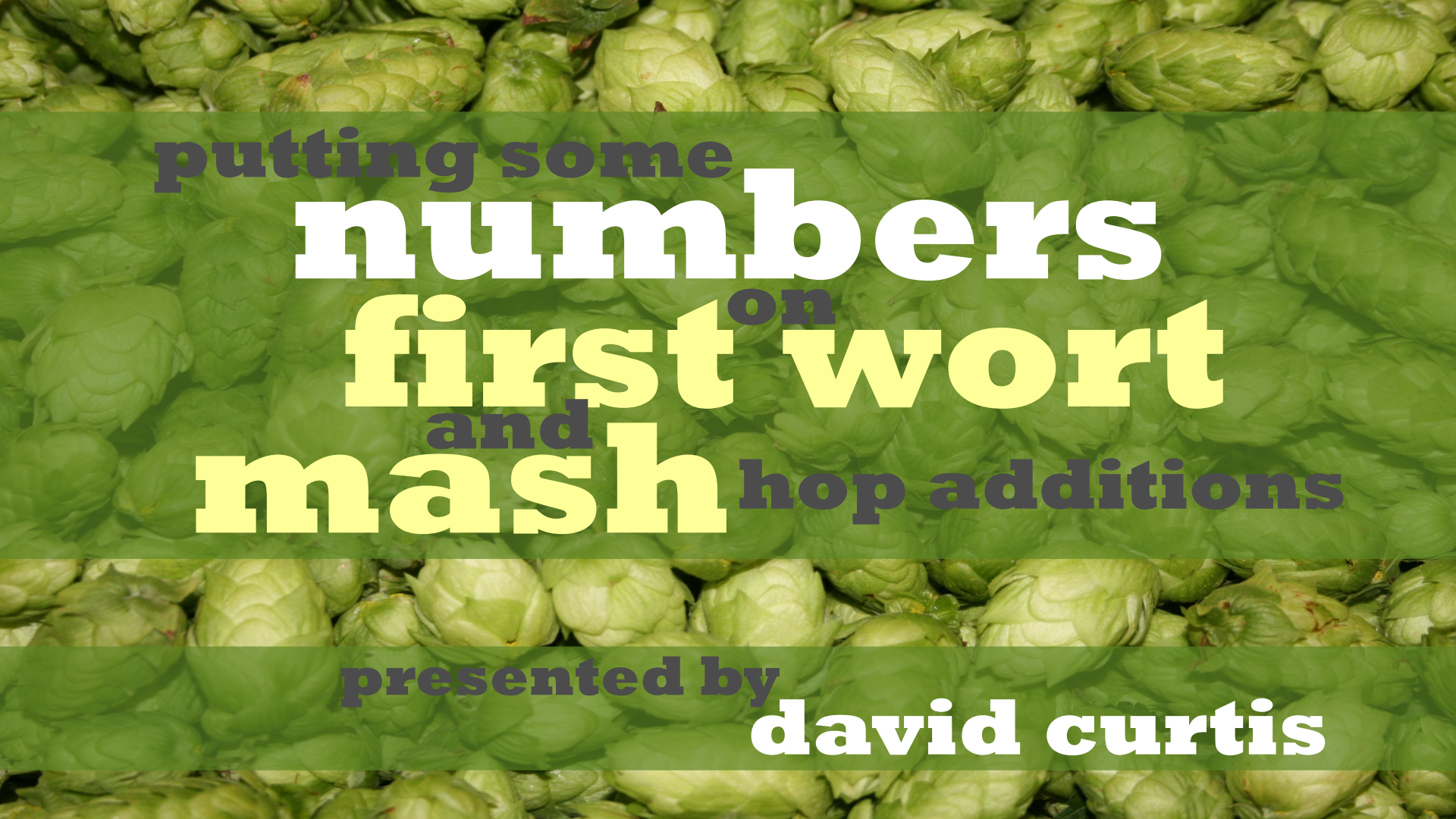
putting some
numbers
on
first wort
and
mash
hop additions
presented by
david curtis

standardized hopping

- 60 minute bittering
- 20-30 minute flavor
- 0-15 minute aroma
- flameout/whirlpool
- dry hopping

first wort hopping

- old german method
- smoother bitterness
- enhanced flavor
- higher ibu contribution

mash hopping

- waste of hops?
- similar to first wort hops?
- less documentation

what do they add?

- ibu impact
- flavor/aroma impacts
- other impacts

  color, process, etc.

how we use them

first wort hops

- hops added during wort collection in kettle
- use 30% of finishing hops
- only use low alpha hops
- increased ibu contribution

how we use them

mash hops

- hops added directly to the mash
- higher pH & oxygen presence allow volatile compounds to form oxidation products with components in the malt
- resulting compounds are not volatile and remain in the wort through lautering & boil
- more 'rounded' flavor

what we expect

compared to 60 minute addition

mash hopping

- low bitterness addition
- round hop character

first wort hopping

- higher ibu addition
- smoother bitterness
- more hop flavor

the experiment

three batches

- control – 60 min. addition only
- fwh – first wort addition only
- mash – mash addition only

analysis

- tasters – taste panel/peers
- lab data – AntonPaar system

thanks to james spencer, denny conn,
& dan listermann!

the recipe

three gallons

- 1.057
- 8 pounds 2-row malt
- 1 pound munich malt
- 1 ounce cascade hops
- 1 packet us-05 dry yeast
- 34 calculated ibus (tinseth)

the process

- electric herms system
- recirculated mash
- mash temp – 150
- 166 degree mashout

results laboratory

analyzed 39 days after brewing

- control – 19.6 ibus
- first wort hop – 21.6 ibus
- mash hop – 5.7 ibus

thanks to carrie stordeur!

resultstasters

APPEARANCE

ANY NOTICEABLE DIFFERENCES IN THE 3 BEERS' **APPEARANCE**? YES☐ NO☐

IF YES, PLEASE DESCRIBE:

AROMA

WHICH BEER HAS THE MOST **HOP AROMA** ? A☐ B☐ C☐

WHICH BEER HAS THE LEAST **HOP AROMA**? A☐ B☐ C☐

ANY COMMENTS ABOUT THE AROMA OF THESE BEERS?

FLAVOR

WHICH BEER HAS THE MOST HOP **BITTERNESS**? A☐ B☐ C☐

WHICH BEER HAS THE LEAST HOP **BITTERNESS**? A☐ B☐ C☐

ANY COMMENTS ON THE **BITTERNESS** OF THE BEERS?
(SHARPNESS, SMOOTHNESS, ETC.)

WHICH BEER HAS THE MOST **HOP FLAVOR**? A☐ B☐ C☐

WHICH BEER HAS THE LEAST **HOP FLAVOR**? A☐ B☐ C☐

ANY COMMENTS ON THE **FLAVOR** OF THE BEERS?

FINAL COMMENTS

ANY FINAL COMMENTS ON THESE BEERS?
(DIFFERENCES, SIMILARITIES, ETC)

results tasters

homebrew club/co-workers

- 42 tasters
- 69% chose mash as least bitter
- 54% chose fwh as most bitter
- 50% chose fwh as most hop flavor
- 40% chose mash as having most & least aroma

thanks to KLOB/bell's downtown managers!

results tasters

bell's taste panel

- rank in order of hop character
- 14 tasters
- only 1 taster rated mash as most hop character
- only 4 tasters rated mash as 2nd most
- mash=20 pts., fwh=32 pts., control=33 pts.
- 99% confidence=9.21, we had 11.04

thanks to kevin payne!

takeaway round 1

- mash stands out as least bitter
- fwh & 60 minute very hard to discern
- if 60 minute addition is 100%:
  - fwh is 110% of 60 minute
  - mash hop is 29% of 60 minute

round 2 double the hops

- exact same recipe
- 2 oz. of cascade hops
- concentrate more on 60 minute and fwh comparison
- calculated 68 ibus on control

round 2 laboratory

analyzed 25 days after brewing

- control – 31.2 ibus
- first wort hop – 33.7 ibus
- mash hop – 10.8 ibus

thanks to carrie stordeur!

results tasters – round 2

bell's taste panel

only fwh & control
choose most hop character

- 5 of 6 tasters chose first wort hop

takeaway round 2

- if 60 minute addition is 100%:
  - fwh is 108% of 60 minute
  - mash hop is 35% of 60 minute

final thoughts

numbers

- fwh is 8 to 10% higher ibu value
- mash is 30 to 35% of 60 minute

taste

- mash hop has minimal impact
- subtle difference between 60 minute and fwh

questions?