



Firkin With Fruit!

Pit(or no-pit)falls, maintaining balance when using fruit additions

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Agenda

History of fruit fermentations

Selecting the right beverage

Select the right fruit!

Fruit addition timing

Fruit and BALANCE

Preservatives/stabilizers

Uniquely challenging fruits to ferment

Introduction

Attain Balance!
Good selections...
Does it work?



History & Styles

- a) The ancient past
- b) Fruit beers – classic and modern
 - i) Kriek, Framboise, Peche – 1930's onward
[Go Belgians!]
 - ii) Midas Touch – Dogfish Head
 - iii) Fruited (any style)
(1) Radler (post-ferment blend)
 - iii) Fruited sours
(1) Catharina sours
- c) Melomel & Pyment mead styles
- d) Fruited ciders



Select the right beverage for the fruit you want to use – pt. 1

Beer

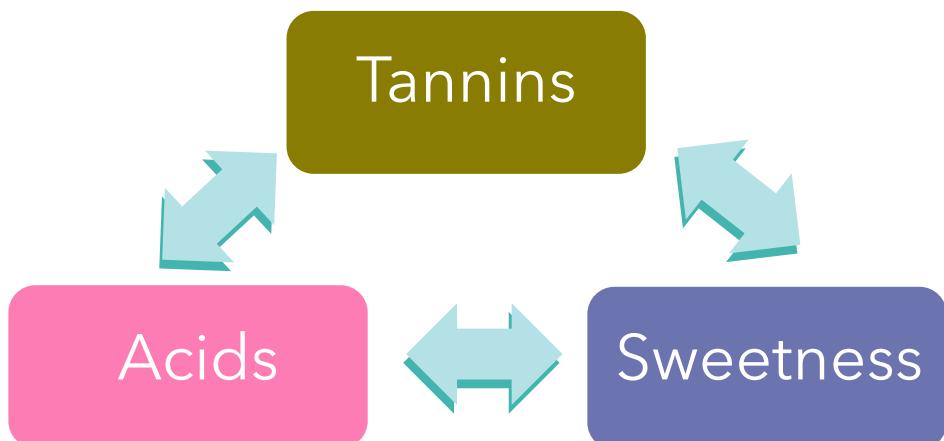
- Be careful of **clashing** hops and fruit
- **Balance:**
 - **acid** (terminal pH)
 - Fruit additions can drive pH down, making final product more acidic
 - **Tannin (a mouthfeel)**
 - Turn down the bittering (hot side) hop additions
 - **Sweetness**

Good styles to try:

- **IPA**
- Citrus with American “C” hops – eg Grapefruit Sculpin
- Tropical Fruits with New World/X-Hops – Thiols – Mango/Passionfruit – Simcoe, Nelson, Galaxy, Nectaron, Mosaic
- **Stout**
- Red fruits like Cherries and Raspberries – Think about things that typically pair well with chocolate and coffee
- **Wheat Beers**
- Almost Anything – fairly neutral canvas
- yeast esters and mild hopping play well with almost any fruit; Berries, stone fruits, tropical fruits, citrus (lemon in hefeweizen)

Select the right beverage for the fruit you want to use pt. 2

Wine, Cider, Mead



Conversely, select the right fruit for the beverage you want to make

Basics of most fruits:

- Skin
- Flesh
- Pit?
- Seed?
- Achene?
- Stems, leaves, etc.

What's inside?

- Sugars
 - Fermentable
 - Unfermentable
 - Why you need them
- Acids
- Flavors – esters, thiols, etc.



Fruit Format

#1 – did you taste it?

- **Fresh**
 - Fully ripe? (not ‘eating’ ripe)
 - Clean and prep
- **Frozen**
 - Handy!
 - Flavor/quality?
 - Already frozen once, easy to macerate
- **Puree**
 - Handy!
 - Pasteurized – look for single-step UHT – less ‘cooked’
- **Canned/processed**
 - Handy!
 - Cooked twice – canning is a ‘double retort’ process
- **Juice**
 - Handy!
 - Check for preservatives – sorbates, benzoates

Great choice for labor-intensive fruits, like pomegranate

Fresh Fruit

Cleaning – is a thorough wash good enough?

- Wild yeast
- Lactic bacteria on vegetables & pepper stems
- Wine/cider/mead – sulfites

Puree & pasteurize

- 15 mins @ 150-170F
- Use a double-boiler
- Don’t heat/boil extended time – activates pectin in fruits (175-185F)
- don’t add to the kettle

Usage – how much fruit?

Dosing Charts

Brett Kollmann Baker
COO/Brewmaster – Urban Artifact – Cincinnati, OH



	Beer First Flavor (fermented)			Fruit First Flavor (fermented)			Post-fermentation Fruit Additions		
	Low Intensity lbs / bbl	Medium Intensity lbs / bbl	High Intensity lbs / bbl	Low Intensity lbs / bbl	Medium Intensity lbs / bbl	High Intensity lbs / bbl	Low Intensity lbs / bbl	Medium Intensity lbs / bbl	High Intensity lbs / bbl
Orchard Fruits	10	20	31	40	77.5	115	23	50	75
Tropical	8	15	23	30	62	93	20	40	62
Red Fruits	5	10	15	20	40	62	15	31	45
Citrus	1.5	3	5	10	20	31	5	10	15

Beer Usage Table - Courtesy Les Vergers Boiron

Preparation

To Skin or not to Skin

- e.g., cucumbers = vegetal notes
- Remove thick skins – mango, papaya, watermelon
- Citrus – pith vs zest

To Seed or not to Seed?

- Seeds, pits, stones can contain cyanide precursors. Trivial amount, but less you ingest, the better
- Excellent Zymurgy article by Joe Formanek on AHA website – Nov/Dec 2000 issue

Remove large stones – mango, peach, plum, apricot

- **Cherry pitting** = get a pitter!
- Leave in for almond flavor in Kriek
 - Or, substitute a shot of Amaretto



Break it down - Macerate, crush, blender, processor

- **Puree** in a food processor
 - Remember that Vitamix you bought years ago?
- **Chop**, quarter
- **Crush** softer using sanitized potato masher or whisk
- **Freeze/thaw** (Mike's favorite method)
 - Zip lock bag
 - Water freezing/expanding breaks cell walls
 - Sanitize, then cut corner of bag
- **Pectins and Pectinase/Pectic Enzyme**
 - A big starch molecule – gives cell walls structure
 - Pectin + sugar + acid = jelly
 - Pectin Haze
 - When and why



Strainer Bags, Filters, Finings

Strainer Bags

- Single-use muslin
- Nylon
- Sanitize before using

Filters

- Buon Vino Super-Jet, Mini-Jet
- Good for wine, mead, cider, but NOT BEER

Finings

- In most cases, **time** and **racking** will clarify
- Gelatin (not vegan)
 - Inexpensive
 - Works very well in beer, cider, mead
 - + cold crash
- Isinglass (not vegan)
 - Fish swim bladders
 - Available liquid or dry form

Kieselsol/chitosan

- 2-part clarifier
- - best suited for wine

Bentonite/Sparkolloid

- clay/earth finings
- usually used in wines

Fermentation Considerations

Sugar

- Will increase gravity and final alcohol content
- Use USDA Food Data Central



Acidity

- As mentioned earlier, most fruits will drive acidity down
- Get a good pH meter
- Beermakers – improve your mash targets
- Check your starting pH
- Check yeast specs!



Tannin Contribution

- can use oak
- Can use a black tea tincture

Color

Sensory/mouthfeel

Nitrogen - YAN/FAN

- Besides sugar, the most important yeast nutrient
- YAN = Yeast Assimilable Nitrogen
- FAN = Free Amino Nitrogen
- **YAN** = FAN + Ammonia + Ammonium Ion available to yeast
- Low YAN can create a stuck fermentation
- Usually plenty in beermaking – barley a good source
- 200 ppm YAN minimum, higher as sugar level increases
- Ciders, mead and some wine grapes tend to be low in Nitrogen
- *More YAN = wild/spoilage organisms can flourish

Addition Timing

Co-Fermentation

- add fruit at time of primary ferment
- Expect more vinous flavors
- Vigorous ferment can drive off fruit flavor/aroma

Secondary Fermentation

- Add fruit just after primary fermentation completed
- Expect more fruit flavor

Don't expect 'fresh fruit flavors' from fermentation

- Cider shouldn't taste like fresh apples any more than beer should taste like fresh malt
- Wine doesn't taste like fresh grapes
- Fermented fruit doesn't taste like fresh fruit!

Side note – Flavorings

"Extract" vs "Natural Flavoring" vs "Artificial Flavoring"

- **Extract** = compounds, flavors, found only in that fruit
 - Emulsions are water-based extracts
- **Natural Flavoring** = flavors, extracts, compounds found from any other plants/foods to make the flavor profile
- **Artificial flavor** = flavors that are not defined as natural, even if they have the exact same chemical composition as flavors isolated directly from nature

Example: Artificial 'Maple'= **sotolone**

- Can be isolated from the herb Fenugreek
- Vanilla..... → → →



Preservatives and Stabilizers

Sulfites

- Use to sanitize fruit
- Prevent further fermentation
- Antioxidant
- pH-dependent
- Sodium metabisulfite – good equipment cleaner
- Potassium metabisulfite – preferred for beverage additions
- Campden tablets – easy to use

Potassium Sorbate

- Ex: Sorbistat-K
- Yeast inhibitor
- Useful when back-sweetening mead, wine, cider
- Best when paired with sulfites
- Don't use with malolactic or lacto cultures
- Won't stop an active fermentation

Sodium or Potassium Benzoate

- Yeast inhibitor
- Commonly used in commercial fruit juices

Avoiding Modern Bomb-Making

Managing post-fermentation fruit additions

- Inhibiting re-fermentation
- Preventing 'gushers' or exploding bottles
- Use sulfites + sorbates

OR

- Keep refrigerated and consume fresh
- Bottle Pasteurization – complex, time-consuming, potentially dangerous

Unique and challenging fruits

Pineapple

- Contains **bromelain** – a *protease* = breaks down proteins
- Can kill foam stability/head on beer

Agave

- Contains **furfural**
- Can be toxic to many yeast in high concentration

The strangeness of strawberry

- ‘barfy’ notes in strawberries and other high-butyrate fruits
- Basic organic acid = butyric acid = baby vomit
- Butyric acid + alcohol = butyrate esters = tropical fruits
- Sometimes the ethanoates flash off, leaving butyrins...



Thank You!



USDA FoodData Central

<https://fdc.nal.usda.gov/index.html>

<https://fdc.nal.usda.gov/fdc-app.html#/food-details/2263889/nutrients>

100 grams Blueberries

Carbohydrates:		
Carbohydrate, by difference	14.6	g
Sugars, Total NLEA	9.36	g
Sucrose	<0.25	g
Glucose	4.42	g
Fructose	4.94	g
Lactose	<0.25	g
Maltose	<0.25	g
Galactose	<0.1	g

Fruit	Portion	Sugar (Grams)
Apple Juice	Cup	24.0
Apples, Granny Smith w/ Skin	Cup	10.5
Apricots, Dried	Cup	69.5
Apricots, Sliced	Cup	15.0
Bananas, Mashed	Cup	27.5
Blackberries	Cup	7.0
Blueberries	Cup	14.7
Cherries, Sour Red, Frozen	Cup	14.0
Cherries, Sweet, Pitted	Cup	19.7
Cranberries, Raw, Whole	Cup	4.0
Currants, Red or White, Raw	Cup	8.3
Dates, Medjool, Pitted	Each	16.0
Figs, Fresh, Chopped	Cup	30.0
Goji Berries, Dried	Cup	65.0
Guava	Cup	15.0
Kiwi	Cup	16.2
Lime	Each	1.0
Lychee	Cup	29.0
Mango, Chopped	Cup	22.5
Nectarines, Sliced	Cup	11.3
Oranges, Mandarin, Pieces	Cup	20.6
Papaya, Chopped	Cup	11.3
Passion Fruit	Cup	26.4
Peaches, Sliced	Cup	12.9
Persimmon	Each	21.1
Pineapple, Fresh, Chunks	Cup	16.3
Plums, Sliced	Cup	16.4
Pomegranates, Juice	Cup	31.0
Raisins, Golden Seedless, Packed	Cup	108.4
Raspberries	Cup	5.4
Rhubarb, Diced	Cup	1.3
Soursop	Cup	30.5
Starfruit, Sliced	Cup	4.3
Strawberries	Cup	7.4

Side Note - Vanilla

The most popular flavor worldwide

- 250 taste and aroma components

Castoreum Extract

- Ummm...a natural flavor, since it comes from a living organism
- Considered GRAS, but not a lot currently produced/used

Bulk Vanilla Substitute

- Vanillin from wood pulp extracts
 - Guaiacol & lignin
- Higher purity of vanillin than real vanilla

