

Presented to Sacramento Home Winemakers Meeting
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Basic Steps in Making Exotic Wines
By Joe Real and Val Tiangco

1. Fruit Preparation
2. Additives I: Sterilization, Enzymatic reaction
3. Additives II: Sugars and Nutrients
4. Yeast Fermentation
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Wine Additives

Enzymes: Almost always, you need to use enzymes especially when you don't have access to tree-ripened fruits. The amount of enzymes depends upon the fruit types and their maturity. Enzymes work best if you know their operating temperature. They are added before fermentation is started, between 4 to 72 hours before fermentation is started. Using optimum temperature will shorten the required reaction time. If the fruit is starchy or suspected to have starch, use amylase or amyloglucosidase enzyme. If the fruits have high pectin content, such as less mature fruits, use more pectic enzymes. I don't recommend starting the fermentation during enzymatic reactions to decrease the formation of methylated compounds and methanol as in the case of pectic enzymes.

Pectic Enzymes: Probably the most important fruit wine enzyme. It breaks down pectins removing pectin hazes in the final wine, helps break down other complex sugars and polysaccharides which make up cell walls and other fruit tissues, converting them into sugars and releasing juices and flavors, increasing the yield of wine from the fruits.

- 80% activity at 80 deg F
- 100% activity at 113 deg F
- Degrades at 131 deg F
- optimum pH at 4.5
- Works best in low sugar concentration
- Different kinds depending on sources
- 0.1% is the highest recommended level for maximum reaction and to minimize methanol products.

Amylases and amyloglucosidases: There are several kinds of amylases and they have different optimum temperature. Use about 1 gram /gal to help break down starchy compounds. Follow the manufacturer's guidelines.

Cellulases: Typically are never required for fruit wines. Only for the more advanced and most exotic wine making when the base material is mostly cellulose and have very little sugars. This step would require various pre-treatments and then the proper application of cellulases to break down cellulose and hemicelluloses into sugars. I have used this for specialty wines from grasses, bamboo or coconut pith. These types of wines are the most complex to make as it involve more steps than beer making.

Metabisulfites: The cheaper one is Na-Meta and the other is K-Meta. I recommend K-Meta to lower sodium content of the wine. I like to use the Campden tablet form because it is pre-measured and very convenient to use. These are added during the enzymatic reaction phase. Typically, 2 Campden tablets per gallon of must are enough to sustain sanitary conditions for more than 24 hours for the enzymatic reactions to complete.

Acids: Many fruits lack acids. You need acid to balance the flavor of the wine, make sulfite more effective, aid in the extraction of colors, helps minimize oxidation, counteract the bleaching effect of sulfites, create environment favorable for yeasts.

According to taste. Get an idea of how acids taste. Prepare a sample of 0.25 gram per 5 oz water (approx. 0.33% acidity) of each available acid type, then taste and compare.

For beginners and competitions with most likely judges have only tasted grape wines, lean towards adding more tartaric acid.

For the brave and daring, a true rare fruit aficionado, emphasize the dominant acids of the fruits to enhance its flavor. Add between 2.5 to 10 grams acid/gallon (½ to 2 tsp/gallon)

- Tartaric Acid: Grapes
- Malic Acid: Pomes (Apple, Pear, Loquat) and Stones (Peach, Plum, Cherry)
- Citric Acid: Citrus, Berries
- Acid Blend: Exotics and Unknown Fruit Types

Tannins: I generally don't recommend adding tannins in making exotic wines, it destroys the essence of the fruit flavor.

Sugars: Majority of the non-grape fruits has a lot lower brix than grapes. For home winemaking where we have less than ideal equipments and environments, it is very important to produce a biologically stable wine. A biologically stable wine based on experiences shared by many home winemakers is to achieve ABV of at least 10.8%. At this alcohol content, 99.99% of known pathogens to humans won't survive. Lower alcohol content would require sterile filtration and lots of unsavory sulfites and sorbate. Use a minimum of 20° Brix. Maximum depends on how high PA you want and your yeast.

Yeast Nutrients and Energizer: Many of the fruits are lacking in the nutrients required by yeast to complete fermentation. The wine yeasts are designed for grapes, and most fruits do not have the same amount and type of nutrients from grapes needed by the yeasts to reproduce and

complete the fermentation. Too often many fruit musts become stuck and remain overly sweet and unstable because of the lack of yeast nutrients. There are very few fruits that have the same or equivalent nutrient contents as grapes. The most common yeast nutrient is food grade Diammonium Phosphate. The energizer is usually made from yeast hulls or recycled yeast cells. Some manufacturers have complete package such as Nutravit and Fermaid. There are also newer products on the market. It is always safer to have more yeast nutrients than end up with a stuck fermentation that is common in exotic winemaking.

Yeasts: Here's the most common yeast that I like to use for specific purposes. I don't usually stick with one type of yeast for each fruit type.

- Lalvin EC-1118 (Prise de Mousse), Premiere Cuvee: Neutral, all around, dry, high brix, excellent for first-time untried fruits, fermenting with skin on and heavy pulps, restarting stuck fermentation.
- Lalvin ICV-D47 (Côtes-du-Rhône): non-grape whites - persimmon, peach, nectarine, paw-paw, mead, and mango, as well as aromatic wines such as rose petal, elderflower, anise and lemongrass.
- Montrachet : will usually give interesting flavor tones from otherwise one-dimensional palate. It gives more complexity to Pineapples, Tomatoes, plums and pluots. Sometimes you may not like the complexity.
- Lalvin RC212 (Bourgovin): non-grape reds - maximizes color extraction – dark plums, cherries, prickly pear cactus fruit, pomegranates and various berries (black/blue/rasp/drew/mul/marion -berries).
- Flor Sherry – Sherry and Port style wines.

Recipes for 5 Gallon of Premium Exotic Wines
by Joe Real and Val Tiangco

Produce/Base	Amount	Unit	Sugar ^a (lbs)	Yeast nutrient (g)	Yeast Energy (g)	Pectic Enz. (g)	Amylase Enz. (g)	Acids ^b (g)	Recomm. Yeast	Naturally Dominant Acid	Recomm. Acid	Type
Apple Juice	5	gal	4	15.0	0.0	7.0	0.0	15.0	EC-1118	Malic	Acid Blend	Pomes
Apple Pulps	20-40	lbs	8	10.0	0.0	27.0	3.0	30.0	EC-1118	Malic	Acid Blend	Pomes
Apricot	15-50	lbs	8	0.0	8.0	10.0	3.0	30.0	EC-1118	Malic	Acid Blend	Pomes
Pear	20-40	lbs	7	10.0	8.0	27.0	7.0	40.0	EC-1118	Malic	Acid Blend	Pomes
Blueberry	15-45	lbs	8	12.0	8.0	14.0	0.0	35.0	Montrachet	Citric	Citric	Berries
Currant	15-30	lbs	8	10.0	0.0	14.0	7.0	0.0	Red Pasture	Citric	Tartaric	Berries
Elderberry	10-25	lbs	9	20.0	6.0	7.0	0.0	30.0	RC-212	Citric	Tartaric	Berries
Gooseberry	15-45	lbs	7	0.0	8.0	27.0	7.0	15.0	Champagne	Citric	Acid Blend	Berries
Raspberry	15-45	lbs	7	15.0	6.0	10.0	3.0	30.0	ICV D47	Citric	Acid Blend	Berries
Strawberry	15-50	lbs	8	10.0	3.0	14.0	3.0	30.0	ICV D47	Citric	Acid Blend	Berries
Blackberry	15-30	lbs	7	15.0	8.0	7.0	0.0	25.0	RC-212	Citric/Malic	Citric	M.Berries
Cranberry	15-30	lbs	10	0.0	8.0	14.0	7.0	0.0	Montrachet	Citric/Malic	Tartaric	M.Berries
Mulberry	15-45	lbs	7	15.0	0.0	10.0	0.0	15.0	Montrachet	Citric/Malic	Tartaric	M.Berries
Grapefruit	10-50	lbs	8	25.0	8.0	27.0	0.0	0.0	Champagne	Citric	Tartaric	Citrus
Persimmon	30-50	lbs	7	12.0	6.0	7.0	7.0	10.0	Champagne	Ascorbic	Citric	Exotic
Cherry	15-45	lbs	5	0.0	8.0	14.0	0.0	30.0	Montrachet	Malic	Citric	Exotic
Peach	15-50	lbs	7	0.0	6.0	17.0	7.0	35.0	EC-1118	Malic	Acid Blend	Exotic
Plum	15-50	lbs	5	5.0	6.0	0.0	3.0	15.0	RC-212	Malic	Acid Blend	Exotic
Dandelion	5-7	qts	12	25.0	6.0	7.0	3.0	45.0	K1V-1116		Acid Blend	Exotic
Fig,	15-45	lbs	7	25.0	0.0	27.0	7.0	60.0	K1V-1116	Malic	Acid Blend	Exotic
Ginger	3-7	lbs	12	34.0	8.0	7.0	7.0	0.0	K1V-1116	Ferulic, dihydro-	Citric	Exotic
Hibiscus petals, dried	2-8	lbs	8	25.0	0.0	27.0	7.0	15.0	EC-1118	Citric	Acid Blend	Exotic
Jasmine Petals, Dried	4-7	lbs	12	35.0	8.0	27.0	7.0	60.0	EC-1118		Acid Blend	Exotic
Mead	10-15	lbs	0	20.0	10.0	3.0	0.0	15.0	Champagne	Gluconic	Citric	Exotic
Pineapple	15-50	lbs	6	25.0	8.0	7.0	0.0	15.0	Montrachet	Citric	Citric	Exotic
Rhubarb	5-20	lbs	12	25.0	8.0	4.0	3.0	0.0	Montrachet	Malic/Oxalic	Tartaric	Exotic
Watermelon	40-80	lbs	9	20.0	3.0	7.0	3.0	40.0	Champagne	Malic	Acid Blend	Exotic

^a depends on how strong or sweet, recommended brix 22 - 26

^b Total of Tartaric, Malic, citric, Ascorbic, or Acid Blend

RECOMMENDED TOTAL ACIDS IN FINAL EXOTIC WINES

(Drier use low range, Sweeter use higher range.)

Fortified (Sherry, Port, Aperitif)0.45-0.75%

White or Blush0.50-0.70

Red or Dark.....0.45-0.65%

Approximate Carbohydrates and Water Content

Produce/Base	Calories per piece	Carbs (grams)	Water Content	Fruit pulp	weight grams
Apple (1 average)	44 calories	10.5	85%	10%	200
Apple cooking	35 calories	9	88%	8%	200
Apricot	30 calories	6.7	85%	9%	110
Avocado	150 calories	2	60%	39%	200
Banana	107 calories	26	75%	8%	150
Blackberries each	1 calorie	0.2	85%	13%	10
Blackcurrant each	1.1 calorie	0.25	77%	21%	10
Blueberries (new) 100g	49 Cals (100g)	15	81%	4%	100
Cherry each	2.4 calories	0.6	83%	14%	20
Clementine	24 cals	5	66%	28%	80
Currants	5 calories	1.4	16%	70%	10
Damson plum	28 calories	7.2	70%	12%	40
One average date 5g	5 cals	1.2	14%	62%	5
Dates with inverted sugar 100g	250 calories	63	12%	25%	100
Figs	10 calories	2.4	24%	70%	40
Gooseberries	2.6 calories	0.65	80%	17%	25
Grapes 100g Seedless	50 cals	15	82%	3%	100
one average Grape 6g	3 calories	0.9	82%	3%	6
Grapefruit whole	100 calories	23	65%	26%	250
Guava	24 calories	4.4	85%	10%	80
Kiwi	34 calories	8	75%	15%	80
Lemon	20 calories	3.4	85%	12%	125
Lychees	3 calories	0.7	80%	17%	20
Mango	40 calories	9.5	80%	15%	200
Melon Honeydew (130g)	36 calories	9	90%	3%	130
Melon Canteloupe (130g)	25 cals	6	93%	2%	130
Nectarines	42 calories	9	80%	14%	140
Olives	6.8 calories	0.4	63%	33%	10
Orange average	35 calories	8.5	73%	23%	200
Orange large 350g	100 Cals	22	75%	19%	350
Papaya Diced (small handful)	67 Cals (20g)	17	80%	3%	100
Passion Fruit	30 calories	3	50%	47%	100
Paw Paw	28 calories	6	70%	24%	100
Peach	35 calories	7	80%	17%	200
Pear	45 calories	12	77%	17%	200
Pineapple	50 calories	12	85%	9%	200
Plum	25 calories	6	79%	9%	50
Prunes	9 calories	2.2	37%	58%	45
Raisins	5 calories	1.4	13%	59%	5
Raspberries each	1.1 calories	0.2	87%	3%	2
Rhubarb	8 calories	0.8	95%	4%	100
Satsuma one average 112g	29 cals	6.5	88%	6%	112
Satsumas 100g	35 calories	8.5	88%	4%	100
Strawberries (1 average)	2.7 calories	0.6	90%	8%	25
Sultanas	5 calories	1.4	16%	14%	2
Tangerine	26 calories	6	88%	7%	112
Tomatoes (1 average size)	9 cals	2.2	93%	3%	60
Tomatoes Cherry (1 average size)	2 calories	0.5	90%	5%	10

All values correct at time of testing, values for fruit calories may vary between different pieces!

* Fruit calories will vary depending on the size of fruit consumed. Some values for fruit calories may not be exact and should only be used for general comparison purposes.

Kiwifruit, green, raw

Refuse: 24% (Skin)

Scientific Name: *Actinidia deliciosa*

Common Name: Chinese gooseberry

NDB No: 09148 (Nutrient values and weights are for edible portion)

Nutrient	Units	Value per	
		100 grams	Std. Error
Proximates			
Water	g	83.07	0.989
Energy	kcal	61	
Energy	kJ	255	
Protein	g	1.14	0.116
Total lipid (fat)	g	0.52	0.12
Ash	g	0.61	0.044
Carbohydrate, by difference	g	14.66	
Fiber, total dietary	g	3	0.211
Sugars, total	g	8.99	0.163
Sucrose	g	0.15	0.021
Glucose (dextrose)	g	4.11	0.055
Fructose	g	4.35	0.084
Lactose	g	0	0
Maltose	g	0.19	0.016
Galactose	g	0.17	0.089
Starch	g	0	0
Minerals			
Calcium, Ca	mg	34	4.113
Iron, Fe	mg	0.31	0.062
Magnesium, Mg	mg	17	0.953
Phosphorus, P	mg	34	1.603
Potassium, K	mg	312	6.598
Sodium, Na	mg	3	0.713
Zinc, Zn	mg	0.14	0.01
Copper, Cu	mg	0.13	0.007
Manganese, Mn	mg	0.098	0.011
Selenium, Se	mcg	0.2	0.04
Vitamins			
Vitamin C, total ascorbic acid	mg	92.7	3.367
Thiamin	mg	0.027	
Riboflavin	mg	0.025	0.003
Niacin	mg	0.341	0.032
Pantothenic acid	mg	0.183	0.025
Vitamin B-6	mg	0.063	0.002
Folate, total	mcg	25	2.021
Folic acid	mcg	0	
Folate, food	mcg	25	2.021
Folate, DFE	mcg_DFE	25	
Choline, total	mg	7.8	
Betaine	mg	0.5	
Vitamin B-12	mcg	0	
Vitamin B-12, added	mcg	0	
Vitamin A, RAE	mcg_RAE	4	0.236
Retinol	mcg	0	
Carotene, beta	mcg	52	2.982
Carotene, alpha	mcg	0	0
Cryptoxanthin, beta	mcg	0	0
Vitamin A, IU	IU	87	4.722
Lycopene	mcg	0	0
Lutein + zeaxanthin	mcg	122	5.764
Vitamin E (alpha-tocopherol)	mg	1.46	0.043
Vitamin E, added	mg	0	
Tocopherol, beta	mg	0	0
Tocopherol, gamma	mg	0.03	0.005
Tocopherol, delta	mg	0	0
Vitamin D (D2 + D3)	mcg	0	
Vitamin D	IU	0	
Vitamin K (phylloquinone)	mcg	40.3	1.796
Lipids			
Fatty acids, total saturated	g	0.029	
Fatty acids, total monounsaturated	g	0.047	
16:1 undifferentiated	g	0	
18:1 undifferentiated	g	0.047	
	20:1	g	0
22:1 undifferentiated	g	0	
Fatty acids, total polyunsaturated	g	0.287	
18:2 undifferentiated	g	0.246	
18:3 undifferentiated	g	0.042	
Cholesterol	mg	0	
Amino acids			
Tryptophan	g	0.015	
Threonine	g	0.047	
Isoleucine	g	0.051	
Leucine	g	0.066	
Lysine	g	0.061	
Methionine	g	0.024	
Cystine	g	0.031	
Phenylalanine	g	0.044	
Tyrosine	g	0.034	
Valine	g	0.057	
Arginine	g	0.081	
Histidine	g	0.027	
Alanine	g	0.053	
Aspartic acid	g	0.126	
Glutamic acid	g	0.184	
Glycine	g	0.06	
Proline	g	0.044	
Serine	g	0.053	

Mangos, raw

Refuse: 31% (Seeds and skin)

Scientific Name: *Mangifera indica*

NDB No: 09176 (Nutrient values and weights are for edible portion)

Nutrient	Units	Value per	
		100 grams	Std. Error
Proximates			
Water	g	81.71	0.323
Energy	kcal	65	
Energy	kJ	272	
Protein	g	0.51	0.025
Total lipid (fat)	g	0.27	0.039
Ash	g	0.5	0.033
Carbohydrate, by difference	g	17	
Fiber, total dietary	g	1.8	
Sugars, total	g	14.8	
Minerals			
Calcium, Ca	mg	10	0.85
Iron, Fe	mg	0.13	0.021
Magnesium, Mg	mg	9	0.58
Phosphorus, P	mg	11	0.746
Potassium, K	mg	156	8.441
Sodium, Na	mg	2	0.624
Zinc, Zn	mg	0.04	
Copper, Cu	mg	0.11	0.009
Manganese, Mn	mg	0.027	0.002
Selenium, Se	mcg	0.6	
Vitamins			
Vitamin C, total ascorbic acid	mg	27.7	1.749
Thiamin	mg	0.058	0.005
Riboflavin	mg	0.057	0.004
Niacin	mg	0.584	0.07
Pantothenic acid	mg	0.16	
Vitamin B-6	mg	0.134	
Folate, total	mcg	14	
Folic acid	mcg	0	
Folate, food	mcg	14	
Folate, DFE	mcg_DFE	14	
Choline, total	mg	7.6	
Vitamin B-12	mcg	0	
Vitamin B-12, added	mcg	0	
Vitamin A, RAE	mcg_RAE	38	
Retinol	mcg	0	
Carotene, beta	mcg	445	50
Carotene, alpha	mcg	17	
Cryptoxanthin, beta	mcg	11	
Vitamin A, IU	IU	765	
Lycopene	mcg	0	
Lutein + zeaxanthin	mcg	0	
Vitamin E (alpha-tocopherol)	mg	1.12	
Vitamin E, added	mg	0	
Vitamin D (D2 + D3)	mcg	0	
Vitamin D	IU	0	
Vitamin K (phylloquinone)	mcg	4.2	
Lipids			
Fatty acids, total saturated	g	0.066	
Fatty acids, total monounsaturated	g	0.101	
16:1 undifferentiated	g	0.048	
18:1 undifferentiated	g	0.054	
	20:1	g	0
22:1 undifferentiated	g	0	
Fatty acids, total polyunsaturated	g	0.051	
18:2 undifferentiated	g	0.014	
18:3 undifferentiated	g	0.037	
	18:4	g	0
20:4 undifferentiated	g	0	
20:5 n-3 (EPA)	g	0	
22:5 n-3 (DPA)	g	0	
22:6 n-3 (DHA)	g	0	
Cholesterol	mg	0	
Amino acids			
Tryptophan	g	0.008	
Threonine	g	0.019	
Isoleucine	g	0.018	
Leucine	g	0.031	
Lysine	g	0.041	
Methionine	g	0.005	
Phenylalanine	g	0.017	
Tyrosine	g	0.01	
Valine	g	0.026	
Arginine	g	0.019	
Histidine	g	0.012	
Alanine	g	0.051	
Aspartic acid	g	0.042	
Glutamic acid	g	0.06	
Glycine	g	0.021	
Proline	g	0.018	
Serine	g	0.022	
Other			
Alcohol, ethyl	g	0	
Caffeine	mg	0	
Theobromine	mg	0	

So how much is a teaspoon, really?

Additive/Chemical	¼ Tsp	1 Tsp	1 Tblsp
	Measured Weight (grams)		
Acid blend, powder	1.24	4.95	14.85
Ascorbic acid, powder	1.15	4.60	13.80
Bentonite, agglomerated	0.89	3.55	10.65
Calcium carbonate, powder	0.60	2.42	7.25
Citric acid, powder	1.21	4.85	14.55
Diammonium phosphate, powder	1.23	4.90	14.70
Fermaid Yeast Nutrient, powder	1.19	4.75	14.25
Gelatin, powder	0.80	3.20	9.60
Grape tannin, powder	0.68	2.70	8.10
Isinglass, powder	0.60	2.40	7.20
Malic acid, powder	1.11	4.45	13.35
Polyclar V, powder	0.34	1.37	4.10
Polyclar VT, powder	0.31	1.25	3.75
Potassium bicarbonate, powder	0.85	3.42	10.25
Potassium bitartrate, powder	0.90	3.60	10.80
Potassium caseinate, powder	0.75	3.00	9.00
Potassium metabisulfite, powder	1.61	6.43	19.30
Potassium sorbate, prilled	0.46	1.85	5.55
Sparkolloid, powder	0.44	1.75	5.25
Tartaric acid, powder	1.26	5.03	15.10
Yeast Energizer, powder	0.71	2.85	8.55