# Specific Gravity, Brix, Baumé, Sugar, Potential Alcohol

## Sugar

Excluding "PA" column 5, the data presented here for potential alcohol levels assumes no soluble solids other than fermentable sugar, and the fermentable sugar quoted is the quantity *in the liquid* for the required respective values. Accounting for non-sugar solutes (aside from "PA" in column 5) is left to the individual winemaker's discretion.

Sugar values themselves under the "Sugar" columns account for the volume changes incurred at the "ends of the scale". The values are taken from *Progressive Winemaking* (P. Duncan & B. Acton, G.W. Kent Inc, 18th impression 1991).

## Potential Alcohol

The Potential Alcohol (PA) level listed assumes a must beginning at the SG given on that same row and fermenting to dryness, i.e. it is the maximum potential alcohol assuming all sugar is fermented and no sugar additions are made after inoculation. PA values are calculated based on "SG"/"Brix" values, not on "Sugar" values.

Potential Alcohol levels vary on the source. This is because the actual quantity of alcohol produced is dependant on the individual yeast strain and fermentation environment. Some sugar is also used by the yeast for growth and production of other compounds, and some alcohol escapes with the carbon dioxide produced during fermentation. The theoretical yield of alcohol from sugar due to alcoholic fermentation (glucose is converted by yeast to ethanol and carbon dioxide) is 51.1% by weight (65 %/volume). However, with these considerations it is closer to 47% by weight (59 %/volume). Jackisch notes that for "red grapes from hot areas" the yield is closer to 43% by weight (54 %/volume) (*Modern Winemaking* by Philip Jackisch, Cornell University Press, 1985).

There are five Potential Alcohol (PA) columns given in the table below.

1. The first is commonly used in amateur home winemaking books (PA = 0.6×Brix - 1).
2. The second is based on a formula given in *Progressive Winemaking* (P. Duncan & B. Acton, G.W. Kent Inc, 18th impression 1991) where, instead of the often quoted 7.36 (or 7.4) factor to divide gravity drops by to obtain alcohol by volume values, the factor is calculated based on the initial gravity (F=7.75 - ((3×original gavity)/800))). They claim that values obtained with this method give values close to those of an ebullioscope and are within +/- 0.5% abv accuracy when final abv is 10-14%.
3. The third method uses the rebased alcohol yield of 51.1% by weight of the sugar content of the must and is calculated based on the Brix value (%abv = Brix×0.59).
4. The fourth method assumes an alcohol yield of 43% by weight of the sugar content of the must and is calculated based on the Brix value (%abv = Brix×0.43).
5. The fifth methods accounts for 3 degrees Brix (0.021 degrees specific gravity) worth of non-sugar solutes and 51.1% by weight alcohol yield. It has been somewhat popularised by UC Davis.

Brix is calculated based on the relationship: Brix = 220×(SG - 1) + 1.6

| SG | Gravity | Brix | Baumé | Sugar | Sugar (lb&oz/US gal.) | | Sugar (lb&oz/Imp. gal.) | | PA 1 (%) | PA 2 (%) | PA 3 (%) | PA 4 (%) | PA 5 (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (degrees) | (degrees) | ((SG-1)×220)+1.6 | | g/l | lb | oz | lb | oz | 0.6Br-1 | F=7.36 | Br×0.59 | Br×0.54 | PA=((Brix-3)×SG)×0.59 |
| 1.000 | 0 | 1.6 | 0.0 | 4 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.9 | 0.9 | 0 |
| 1.005 | 5 | 2.7 | 0.7 | 17 | 0 | 2 | 0 | 3 | 0.6 | 0.7 | 1.6 | 1.5 | 0 |
| 1.010 | 10 | 3.8 | 1.4 | 30 | 0 | 4 | 0 | 5 | 1.3 | 1.4 | 2.2 | 2.1 | 0.5 |
| 1.015 | 15 | 4.9 | 2.1 | 44 | 0 | 6 | 0 | 7 | 1.9 | 2.0 | 2.9 | 2.6 | 1.1 |
| 1.020 | 20 | 6.0 | 2.8 | 57 | 0 | 8 | 0 | 9 | 2.6 | 2.7 | 3.5 | 3.2 | 1.8 |
| 1.025 | 25 | 7.1 | 3.5 | 70 | 0 | 9 | 0 | 11 | 3.3 | 3.4 | 4.2 | 3.8 | 2.5 |
| 1.030 | 30 | 8.2 | 4.2 | 83 | 0 | 11 | 0 | 13 | 3.9 | 4.1 | 4.8 | 4.4 | 3.2 |
| 1.035 | 35 | 9.3 | 4.9 | 97 | 0 | 13 | 0 | 16 | 4.6 | 4.8 | 5.5 | 5.0 | 3.8 |
| 1.040 | 40 | 10.4 | 5.6 | 110 | 0 | 15 | 1 | 2 | 5.2 | 5.4 | 6.1 | 5.6 | 4.5 |
| 1.045 | 45 | 11.5 | 6.2 | 123 | 1 | 0 | 1 | 4 | 5.9 | 6.1 | 6.8 | 6.2 | 5.2 |
| 1.050 | 50 | 12.6 | 6.9 | 136 | 1 | 2 | 1 | 6 | 6.6 | 6.8 | 7.4 | 6.8 | 5.9 |
| 1.055 | 55 | 13.7 | 7.5 | 149 | 1 | 4 | 1 | 8 | 7.2 | 7.5 | 8.1 | 7.4 | 6.7 |
| 1.060 | 60 | 14.8 | 8.2 | 163 | 1 | 6 | 1 | 10 | 7.9 | 8.2 | 8.7 | 8.0 | 7.4 |
| 1.065 | 65 | 15.9 | 8.8 | 176 | 1 | 7 | 1 | 12 | 8.5 | 8.8 | 9.4 | 8.6 | 8.1 |
| 1.070 | 70 | 17.0 | 9.4 | 189 | 1 | 9 | 1 | 14 | 9.2 | 9.5 | 10.0 | 9.2 | 8.8 |
| 1.075 | 75 | 18.1 | 10.1 | 202 | 1 | 11 | 2 | 0 | 9.9 | 10.2 | 10.7 | 9.8 | 9.6 |
| 1.080 | 80 | 19.2 | 10.7 | 215 | 1 | 13 | 2 | 2 | 10.5 | 10.9 | 11.3 | 10.4 | 10.3 |
| 1.085 | 85 | 20.3 | 11.3 | 228 | 1 | 14 | 2 | 5 | 11.2 | 11.5 | 12.0 | 11.0 | 11.1 |
| 1.090 | 90 | 21.4 | 11.9 | 242 | 2 | 0 | 2 | 7 | 11.8 | 12.2 | 12.6 | 11.6 | 11.8 |
| 1.095 | 95 | 22.5 | 12.5 | 255 | 2 | 2 | 2 | 9 | 12.5 | 12.9 | 13.3 | 12.1 | 12.6 |
| 1.100 | 100 | 23.6 | 13.1 | 268 | 2 | 4 | 2 | 11 | 13.2 | 13.6 | 13.9 | 12.7 | 13.4 |
| 1.105 | 105 | 24.7 | 13.7 | 282 | 2 | 6 | 2 | 13 | 13.8 | 14.3 | 14.6 | 13.3 | 14.1 |
| 1.110 | 110 | 25.8 | 14.3 | 295 | 2 | 7 | 2 | 15 | 14.5 | 14.9 | 15.2 | 13.9 | 14.9 |
| 1.115 | 115 | 26.9 | 14.9 | 308 | 2 | 9 | 3 | 1 | 15.1 | 15.6 | 15.9 | 14.5 | 15.7 |
| 1.120 | 120 | 28.0 | 15.5 | 321 | 2 | 11 | 3 | 3 | 15.8 | 16.3 | 16.5 | 15.1 | 16.5 |
| 1.125 | 125 | 29.1 | 16.0 | 335 | 2 | 13 | 3 | 6 | 16.5 | 17.0 | 17.2 | 15.7 | 17.3 |
| 1.130 | 130 | 30.2 | 16.6 | 348 | 2 | 14 | 3 | 8 | 17.1 | 17.7 | 17.8 | 16.3 | 18.1 |
| 1.135 | 135 | 31.3 | 17.1 | 361 | 3 | 0 | 3 | 10 | 17.8 | 18.3 | 18.5 | 16.9 | 19.0 |
| 1.140 | 140 | 32.4 | 17.7 | 374 | 3 | 2 | 3 | 12 | 18.4 | 19.0 | 19.1 | 17.5 | 19.8 |
| 1.145 | 145 | 33.5 | 18.3 | 387 | 3 | 4 | 3 | 14 | 19.1 | 19.7 | 19.8 | 18.1 | 20.6 |
| 1.150 | 150 | 34.6 | 18.8 | 401 | 3 | 6 | 4 | 0 | 19.8 | 20.4 | 20.4 | 18.7 | 21.4 |
| 1.155 | 155 | 35.7 | 19.4 | 414 | 3 | 7 | 4 | 2 | 20.4 | 21.1 | 21.1 | 19.3 | 22.3 |
| 1.160 | 160 | 36.8 | 19.9 | 427 | 3 | 9 | 4 | 4 | 21.1 | 21.7 | 21.7 | 19.9 | 23.1 |