



Beverage Fortification Calculator

Report: example 1

Date: 23 August 2011

Purac knowledge base

We can help you with the following:

Product design

- Syrups / Concentrates (e.g. by factor 4-6)
- Sport drink formulation (viz. osmolality aspects)
- Stability and precipitation calculations
- Advanced chemistry calculations
- Prediction of titratable acidity and pH
- Choosing pH, pH ranges and buffer capacities

Process design

- Plant scale-up
- Pasteurization steps

We like to thank you, Dr. John, for visiting the Purac website and using the light version of our Purac® Beverage Fortification Calculator.



The advanced version of the Purac® Beverage Fortification Calculator is filled with a large variety of acids, bases, and (mineral) salts - and if needed we will add your ingredients as well! Please contact us if you need assistance or if you require different input or calculation results.

Contact

For more information, questions or comments on the Purac® Beverage Fortification Calculator, please contact us at bfc@purac.com.

Modeling Background

Major beverage characteristics such as pH, buffer capacity, stability with respect to salt precipitation, and titratable acidity (important for taste perception) are mainly governed by the ionic species in the solution.

Based on the components you select to define the beverage composition, nine mathematical models are set up automatically. These models consist of large sets of non-linear algebraic equations, which include equilibrium equations, mass balances, electro-neutrality conditions, and Gibbs Excess functions for describing thermodynamically non-ideal behavior.

The models are then solved automatically by the Purac® Beverage Fortification Calculator. The results of the calculations are summarized in this document.

Precipitation

The Purac® Beverage Fortification Calculator predicts whether precipitation will occur. In case you want to verify this experimentally, please note that the formation of solids can be very slow and therefore it may take time before precipitation will actually be observed.

If the Results table below indicates precipitation, you may prevent this by changing your recipe:

- Add more acid, as by lowering the pH salts become more soluble.
- Add lactic acid, or, if citric acid is part of your recipe, replace it (partly) with lactic acid.
- Lower the amount of calcium.

More sophisticated and tailor-made suggestions can be given by your Purac® consultant.

Inputs

Below you can find the recipe and the conditions which you filled in:

Recipe

Ingredients	
Target amount of dissolved calcium	50 mg/100 g
	wt %
Glucose	2.5
Potassium citrate 4aq	5
Sucrose	5
Water	87.5
Total	100

Conditions

Parameter	
Temperature	20 °C
Carbonation	0 mg/100 g

Results

	Puracal® Xpro Calcium lactate (aq)	Puracal® PP Calcium lactate	Gluconal® Ca Calcium gluconate	Calcium citrate 4 aq	
Requested calcium fortification	50	50	50	50	mg/100 g
Required amount of product	0.3333	0.3262	0.3918	0.2071	wt %
Temperature	20	20	20	20	°C
pH without calcium fortification	9.48	9.48	9.48	9.48	
pH with calcium fortification	9.47	9.19	9.47	9.48	
Titrateable acidity	-	-	-	-	mmol/kg
Stability (precipitation)	No solids	No solids	No solids	No solids	

A total number of nine models were generated and solved with an average size of 160 nonlinear equations. It took 88 seconds to solve.

Purac cannot be held responsible for the outcome. The calculations are based on a simple model and other ingredients in your formulation (like other acids) might also cause precipitation.

Purac is a leading company in natural food preservation with 80 years of experience in developing, manufacturing and marketing food solutions in a broad range of industries. Purac operates production plants in the USA, the Netherlands, Spain, Brazil and Thailand, and markets its products through a worldwide network of sales offices and distributors. Purac is headquartered in The Netherlands and is a part of CSM. For more info: www.purac.com/food

