How to Calculate Sucrose Equivalents for a Particular Ingredient

What is Sucrose Equivalents?

Experiments were done to determine the reduction in freezing point for a given concentration of sucrose. For a given ingredient in solution, the equivalent concentration of sucrose that would have the same freezing point depression effect can be calculated (sucrose equivalents). Sucrose equivalents allows the freezing point depression caused by a particular ingredient to be calculated.

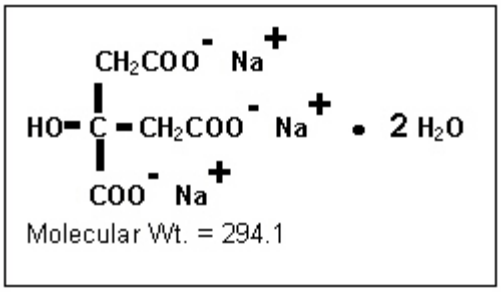
How Is Sucrose Equivalents Calculated?

For ingredients that do not dissociate in water, divide the molecular weight of sucrose (342.3) by the molecular weight of the particular sugar then multiply by 100.

For ingredients that dissociate in water the calculation is as follows:

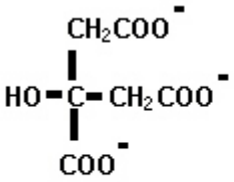
The sucrose equivalents. of an ingredient that can dissociate in water is calculated in a slightly different manner than non-dissociating ingredients. To assign a proper sucrose equivalents, we need to know the molecular weight of each dissociated component as it exists in water.

For example, let's calculate the sucrose equivalents of Sodium Citrate. Sodium Citrate has the following formula and molecular weight:



Molecular Wt. = 294.1

It dissociates to the following:



Citrate
Molecular Wt. 189.1

Sodium
Molecular Wt. = 22.99

Water
Molecular Wt. = 18.00

The percentage of each dissociated component is calculated:
[189.1 / 294.1] x 100 = 64.3% Citrate
[(3 x 22.99) / 294.1] x 100 = 23.5% Sodium
[(2 x 18) / 294.1] x 100 = 12.2% Water

The sucrose equivalents for each component is calculated:
[342.3 / 189.1] x 100 = 181.01 Sucrose Equiv of Citrate
[342.3 / 22.99] x 100 = 1488.9 Sucrose Equiv of Sodium
Water has no sucrose equiv.

Finally the overall sucrose equivalents. for sodium citrate is calculated:
(64.3 / 100) x 181.01 = 116.4
(23.5 / 100) x 1488.9 = 349.9
Total Sucrose Equiv = 466.3

That is 100 grams of sodium citrate is equivalent to 466.3 grams of sucrose in its ability to depress the freezing point of a solution.