Water Activity of Sucrose and NaCl Solutions

One way to reduce the growth rate of pathogens is to reduce the water activity of solutions in which they live. Sucrose (sugar) and NaCl (salt) are often used to adjust the water activity of foods. The following tables indicate to what extent NaCl and sucrose reduce water activity (A_w).

NaCl (g)	Water (g)	% NaCl	A_w
0.9	99.1	0.9	0.995
1.7	98.3	1.7	0.99
3.5	96.5	3.5	0.98
7.0	93.0	7.0	0.96
10.0	90.0	10.0	0.94
13.0	87.0	13.0	0.92
16.0	84.0	16.0	0.90
22.0	78.0	22.0	0.86

reference: *USFDA, The Bad Bug Book*

Sucrose (g)	Water (g)	% Sucrose	A_w
0	100	0	1.00
20	100	16.7	0.998
40	100	28.6	0.969
60	100	37.5	0.955
80	100	44.4	0.941
100	100	50.0	0.927
120	100	54.5	0.913
140	100	58.3	0.900
160	100	61.5	0.888
180	100	64.3	0.876
200	100	66.7	0.860

based on formula:

$$a = \frac{1.00}{1 + 0.27\mathrm{n}}$$

n = #moles sucrose/100 g water

1 mole sucrose = 342 grams

reference: *Principles of Food Science: Part II*

Physical Principles of Food Preservation, page 250

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