

Water Activity a_w of Food

Water is present in some form in most foods, as free or available water; and water that is bound to proteins and carbohydrates.

Available water in food supports the growth of bacteria, yeasts and moulds.

Water (Moisture) content is a measure of the total water in food (the sum of available and bound water) on a wet percent basis.

Water activity, a_w is a measure of available water (the ratio of the vapour pressure of the food to the vapour pressure of pure water).

Water content of common food products

Foods	% Water
apple	84
orange	87
broccoli	91
beef, raw	73
chicken, raw	69
beef, cooked	62
chicken, cooked	62
salami, beef	60
bread	36
jams/preserves	30
beef jerky	23
wheat flour	11
cookies/biscuits	6

Water activity of common food products

Foods	a_w
fresh meat, fish and vegetables	0.99
raw fruits	0.98
cooked meat, bread	0.91-0.98
moist cakes	0.90-0.95
sausages, syrups	0.87-0.91
flours, rice, beans, peas	0.80-0.87
salami	0.82
jams, marmalades, jellies	0.75-0.80
dried fruits	0.60-0.65
dried spices, milk powder	0.20-0.60
biscuits, chocolate	<0.60

Typical water activity limits for microorganisms: Most pathogenic bacteria need a minimum a_w 0.97, yeasts 0.88, and most moulds 0.80. Most potentially hazardous foods have water activity over 0.97. In Canada, a shelf-stable dry food would have a_w less than 0.85

Reduce available water to control the growth of microorganisms in food.

- **Drying:** physically removing water, e.g., beef jerky
- **Adding solutes** such as salt or sugar, e.g., pickles and jams
- **Freezing:** water is removed in the form of ice
- **Combination** of one or more factors described above, e.g., salting and drying fish