

Water activity testing

Water activity (A_w) is an important concept in the feed- and food industries. The water activity of a product may be essential for shelf-life, texture and flow properties. Nofima Ingrediens has the equipment for water activity measurements and can now offer determinations of A_w and sorption isotherms.

A_w is defined as the ratio of water vapour pressure over a sample and the water vapour pressure over pure water at the same temperature. Therefore, A_w can be measured as relative humidity (RH) in the atmosphere surrounding a sample in a closed chamber. If RH in the atmosphere is 80%, A_w of the product is 0.80. Instruments for RH measurements uses different detection principles, most common is dew point measurements with chilled mirror, capacitance sensors or wet/dry bulb thermometers.

Hence, water activity is not equal to water content, but a measure for the amount of free and available water in a product. Parts of the water present will be bound to product constituents by capillary forces or chemical bounds. Solutes like sugar or salts will bind water. Food preservation with salts or sugars therefore inhibits microbial growth by lowering the amount of available water.

Microorganisms are not able to grow at A_w levels below a certain lower limit. Most bacteria can grow only at A_w above 0.90, while minimum A_w for most moulds is about 0.80. Low A_w will also reduce other detrimental product changes during storage, for example lipid oxidation and enzymatic reactions.

In dried products the water requirement of microorganisms can be met if air moisture is high enough for absorption or condensation to occur. A product stored in air with RH 0.80 will attain A_w 0.80 at equilibrium, sufficient for growth of several moulds species. If humid air

is cooled to a temperature equal or lower than dew point, water vapour will condensate and cause serious hygienic problems. Air with 80 % RH at 25 °C will be saturated and start to condensate when reaching 21 °C. If product stability depends on low A_w , close control of temperature and humidity during production and storage is crucial.

Nofima Ingrediens can carry out A_w measurements and determinations of sorption isotherms in products and ingredients. Sorption isotherms showing the relation between water content and A_w , provides valuable information on the interaction between different ingredients, storage properties, need for protective packaging, and more.

For further information, please contact Halvor Nygaard, halvor.nygaard@nofima.no, dir.tel. (+47) 55 50 12 33

Organism	A_w min
Clostridium perfringens	0.95
Bacillus cereus	0.95
Salmonella	0.91
Clostridium botulinum	0.91
Staphylococcus aureus	0.85
Mould (most species)	0.80
Mould (some species)	0.65

