Water activity and the importance in food

Water is an important basic element in foods. For a long time, the industry has known how important it is to check free water. The water activity (a_W) measurement forms the basis of this and provides important information about the quality of a product. Finally it provides information regarding the possibility of microbiological growth on the surface. Only with this conclusions can be made about the stability and durability of a sample

Definition of water activity

Water activity is defined as the current volume and availability of "free" water in a sample and should not be directly compared with the water content (g water/ g substance). The water activity is given as the a_W – value and range between 0 (absolute dryness) and 1 (condensed humidity). Only this component takes an active part in the exchange with the ambient humidity and can possibly form the ideal medium for microbiological growth on the surface which influences the microbiological stability. The water activity also has an important effect on the chemical reactions in food.

The relative humidity is measured in % rH and relates to the a_W –value as follows:

$$a_W = ERH/100$$

The influence of water activity in foods

The relative equilibrium humidity of a product, which is ascertained through its partial pressure of water vapour on the surface, depends on the following factors:

- Chemical compound
- Temperature
- Water content
- Storage environment (T / RH)
- Absolute pressure
- Packing

Free" water in products is jointly responsible for the growth of undesirable organisms such as bacteria or fungi, which produce "toxins" or other harmful substances. But also chemical/biochemical reactions (*e.g. the Maillard reaction*) increasingly take place and possibly change the following factors of a product:

- Microbiological stability *(growth)*
- Chemical stability *(see table)*
- Content of proteins and vitamins
- Colour, taste and nutritional value
- Stability of the compound and durability
- Storage and packing
- Solubility and texture

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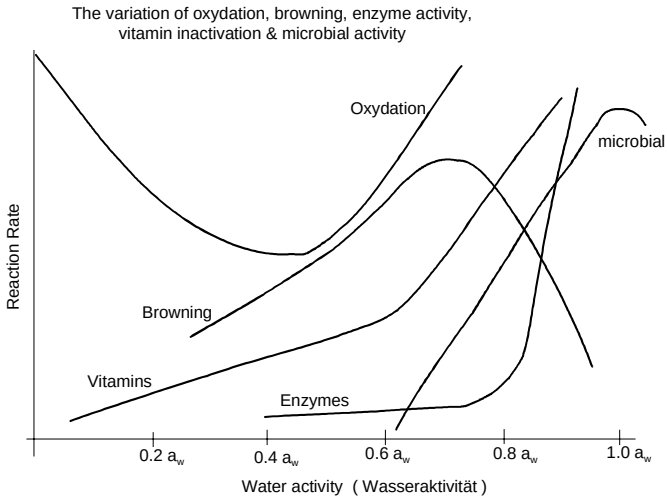
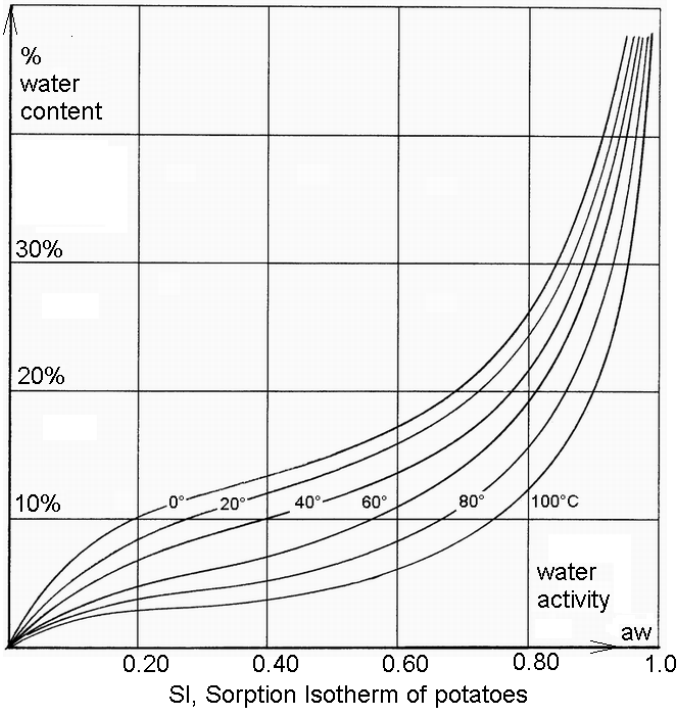
The optimisation and stabilisation of the product properties require a partially narrow upper as well as lower aw value margin. The a_W – value of a product can be changed by adding of so called Humectans. Nowadays the measurement of water activity in the food industry is established in research, development, quality control and production.



Indirect water content determination

With the new water activity instrument of Novasina the determination of the water content via the so-called “sorption isotherm” is possible. The sorption isotherm shows the relation between water content and water activity at a given temperature. With this process, the sample is not destroyed and can correspondingly be stored for future checks.



SI, Sorption Isotherm of potatoes

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