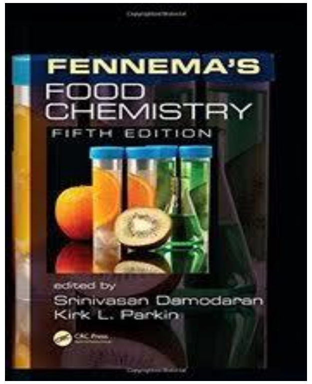
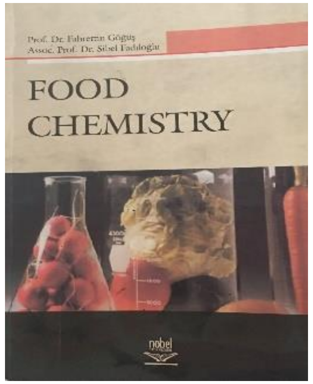
Food Chemistry I

These materials have been prepared by H. Elif Kormalı Ertürün for educational purposes only (as lecture notes) using the following resources. Responsibility for reproducing any part of these materials in any form or by any means or stored in a retrieval system for different purposes, rests with the third person performing the action.

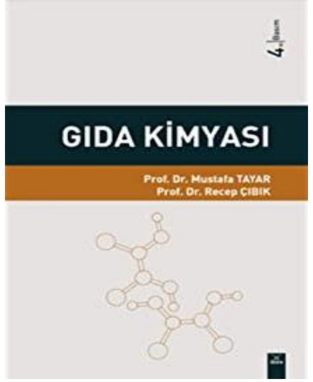
1.



2.



3.



1. Fennema O.R., Ed: Damodaran S. and Parkin K.L. 2017. *Fennema's Food Chemistry*, CRC Press Taylor & Francis Group Boca Raton, FL, USA.
2. Göğüş F. and Fadıloğlu S. 2006. *Food Chemistry*, Nobel Akademik Yayıncılık, Ankara.
3. Tayar M. ve Çıbık R. 2013. *Gıda Kimyası*, Dora Basın-Yayın Dağıtım Ltd. Şti., Bursa.

WATER ACTIVITY

Water activity of a food is not the same thing as its moisture content. It is a measure of that water which is not bound to the food and is therefore available to microbes and other organisms for growth. Foods can have a water activity anywhere between 0 (bone dry) and 1 (pure water).

Water activity of a food material reflects the thermodynamic capacity (energy status) or the effective concentration of water in a food material that can actually participate as a chemical agent in various biological and chemical processes.

DEFINITION AND MEASUREMENT OF WATER ACTIVITY

The activity of water in the pure state is unity, and in an *ideal* solution, the water activity a_w is equal to the mole fraction of water, X_{H2O}, in the solution.

$$a_w = X_{H_2O} = \frac{n_{H_2O}}{n_{H_2O} + n_{solute}}$$

n_{H2O} : is the number of moles of water

n_{solute} : is the number of moles of dissolved solute in the system

Any deviation of from ideality can be accounted for by modifying as

$$a_w = \gamma_w X_w$$

- In ideal systems (solutions) water activity is the mole fraction of water in the system. In nonideal systems however, water activity is a measure of the “effective” concentration (not the mole fraction) of water in a system. It reflects the average energy status of water in a system.
- The fugacity principle is used to measure water activity in a food sample. In practical applications, water activity of a sample is defined as p/p^0 where p is the partial water vapor pressure of the food sample and p^0 is the partial vapor pressure of pure water at equilibrium at the same temperature and pressure.

$$a_w = \left(\frac{f_w}{f_w^0}\right) = \left(\frac{p_w}{p_w^0}\right)$$

p_w :is the partial water vapor pressure above a food material at equilibrium
$P^0{}_w$:is the partial vapor pressure of pure water at equilibrium at the same temperature and pressure

By measuring water activity in foodstuffs, it is possible to:

* predict which microorganisms will be potential sources of spoilage and infection,

* maintain the chemical stability of foods,

* minimize nonenzymatic browning reactions and spontaneous auto catalytic lipid oxidation reactions,

* prolong the desired activity of enzymes and vitamins in food, and

* optimize the physical properties of foods, such as texture and shelf life.