

The influence of water activity on the development of probiotics

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DEFINITION OF WATER ACTIVITY

Water activity is defined as the concentration of free water in a sample and should not be directly compared with the concentration (g a.e./g b.ance). The water activity is generally expressed as a percentage (ab. rel. d. n. e.) and 1 (condensed humidity). Only the components take an active part in the change of 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 reaction in food.

The relative humidity is measured in % RH and relative humidity follows:

$$a_w = ERH / 100$$

(ERH: equilibrium relative humidity).

Free water in products is jointly responsible for the growth of undesirable organisms such as bacteria or fungi, which

produce in the harmful substance. Biochemical / biochemical reaction, e.g. the Maillard reaction, increasingly take place and possibly change the following properties of a product:

- Microbiological stability (growth);
- Chemical stability (Figure 1);
- Content of protein and amino acids; color, appearance and nutritional value;
- Stability of the compound and stability;
- Storage and packaging;
- Solubility and efficiency.

FUNCTIONAL FOODS

The term Functional Food concerns ingredients of microorganisms which have a health-promoting or a disease-preventing effect. In the case of health-promoting substances, a certain peak of health value which complements the nutritional value in the body is reached. The

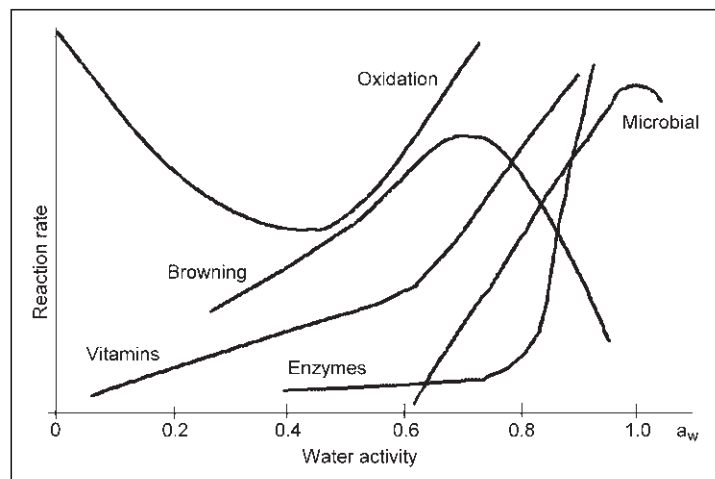


Figure 1 – Variation of oxidation, browning, enzyme activity, vitamin inactivation and microbial activity as a function of water activity

microorganisms used for Functional Food are mainly clostridia originating from dairy products (lactic acid bacteria). The microorganisms are called Probiotic, and bacteria which promote growth are called Prebiotic.

TECHNICAL DEMANDS IN DEVELOPMENT OF PROBIOTICS

For the selection of a suitable strain of Probiotic bacteria the following general criteria apply:

- from the human intestinal tract
- Resistance to gastric juice and secretion of bile
- Efficiently able to gain in the intestine

Indication on preferable properties such as the binding capacity of cell to the intestinal wall or production of antimicrobial substances

Technical properties like a sufficient minimum number of bacteria before and after fermentation and during storage

The majority of Probiotic products belong to the *Lactobacillus* family which are acid fast lactic acid anaerobic in the lower intestine and to the *Bifidobacteria* which are acid sensitive in the colon and lactic acid anaerobic.

CONDITIONS FOR PROBIOTICAL PREPARATION

The most important challenge during the formulation of probiotic

preparation is the environmental stability which means the conservation of a large number of viable bacteria cells. A dehydrated probiotic product has to be stored at 5-10°C. The packaging should not contain oxygen, carbon dioxide and the absence of moisture should be between 0.1-0.25 a.u. A high availability of free water could have an impact on the metabolic processes causing potential degradation effects, while low water activity could cause irreversible damage of the bacterial cell.

The production of probiotic products can range from one strain of bacteria. The culture media are filled in a fermenter and inoculated in preparation. The microorganisms will be prepared from the medium by centrifugation, washed and formulated. A final product strain can be available in liquid, deep-frozen or dehydrated form. Spreading of free dehydrated material applied during processing of Probiotic. After the dehydration the probiotic products might be encapsulated or made in a form of tablets or capsules. find the application for products.

During the fabrication of capsules or tablets one should have to remain aware of the stability of the capsule or tablet during the



The LabMaster-aw – the latest water activity instrument from Novasina

storage stability. The packaging during the fabrication of tablets or capsules should be selected in the area of the bacterial cell will not be mechanically damaged.

Most of the Probiotic products make use of the moisture which is added in the process with the help of pharmaceutical technology and capsule filling machines.

Water activity (a_w) is an important factor affecting the stability of dehydrated products during processing. The control of water activity in dehydrated products is essential for the stability, density and dehydration properties.

Does it have an impact on the stability of dehydrated products? Water activity measurement could provide the answer!

For more information can be found on our website www.novasina.com.