

Sample Preparation

One factor that may affect the water activity (a_w) measurement is the sample preparation procedure. Eliminating or reducing this potential variable will yield more consistent and reliable water activity readings. Reducing variability due to sample preparation will also enable researchers and technicians to better identify other causes of a_w change in their products.

Prominent reasons for product a_w fluctuation not due to sample preparation include changes in product formulation, processing methods, or temperature. Such changes may influence product quality, shelf-life, and safety.

It is important to understand the effects of sample preparation and establish procedures to minimize this variable. In order to do this, it is necessary to understand how preparation methods affect different products. Decagon conducted the following research on a diverse range of multi-component food, pharmaceutical, and cosmetic products using three different preparation methods.

Sample Preparation Testing

To test the effect of sample preparation three different methods were used. The first sample preparation method involved taking the sample from its original packaging and directly placing into a sample cup. All samples fit into the sample cup with no modification to their original form. The water activity was measured using an AquaLab

Series 3 water activity meter. Sample temperature and water activity were recorded. In the second portion of the experiment, new samples were removed from the original packaging and cut or sliced in half before placing into a sample dish. The water activity of each was measured immediately after slicing. In the third experiment, samples were taken from their original packaging and ground for approximately 30 seconds using a mortar and pestle. The samples were immediately transferred to a sample cup, and again, the water activity of each processed sample was measured.

Discussion

The tested products showed varying degrees of influence due to preparation methods. Differences in water activity readings before and after sample cutting or grinding were most pronounced on gel-coated solid dosage forms and the non-coated OTC pharmaceutical product. The four food products tested showed relatively small changes in water activity due to preparation methods.

Recommendations

Representative Sampling – If you are measuring the water activity of consumer products, test them in their final state. If the product isn't chopped, ground, or sliced before it reaches consumers, avoid doing this to the product before you measure its water activity. Because AquaLab accommodates samples with a volume of less

Figure 1. Results

Sample Name	No Sample Preparation		One cut or slice		Ground with Mortar and Pestle	
	a_w	Temp. (°C)	a_w	Temp. (°C)	a_w	Temp. (°C)
Frosting Coated Cookie	0.233	24.8	0.234	24.7	0.235	27.2
Chocolate Sandwich Cookie	0.120	24.8	0.127	26.0	0.126	24.9
Antacid Tablet	0.299	25.4	0.306	25.9	0.294	26.1
Candy-coated Chocolate	0.279	25.0	0.311	25.8	0.287	26.5
Liquid-Filled Capsules	0.559	24.0	0.538	25.1	N/A	N/A
Gel-Coated Solid Dosage Form	0.458	24.9	0.372	25.1	0.348	25.9
OTC Pharmaceutical (non-coated)	0.118	27.9	0.270	26.0	0.269	26.0
Chocolate-Coated Raisins	0.345	26.0	0.345	26.0	0.421	27.1

than 10 mL, it is inevitable that some slicing or cutting may be necessary. Keeping this to a minimum will insure that the a_w of the product you test will be the same as the consumer product. When measuring multi-component foods place a representative amount of each component into the sample cup. In other words, if you're measuring a product which is filling sandwiched between two cookies, put both parts (cookie and filling) into the sample cup.

Consistency – Establish a sampling procedure with set guidelines. For example, specify how long your samples should be ground, how they should be handled, and (if you have a temperature controlled AquaLab) at what temperature they should be measured.

Your own testing – Perform preparation tests on your own samples and measure the change in water activity that results. Use this data to determine the method which best produces stable

results, and incorporate this procedure into your sample preparation practices.

Efficiency – Use the testing data above and your own testing data as a guideline to determine what kind of preparation procedure is right for your products. Eliminate any which you decide are unnecessary.

Sample Exposure – Many products can gain or lose moisture through being exposed to ambient air. In general, exposed products with an a_w higher than room humidity will lose moisture, and those with an ERH below room humidity will gain moisture. In order to avoid moisture gain or loss, keep time that the samples are exposed to ambient humidity to a minimum. The sample lids are excellent for short-term storage of samples in the sample cups. Parafilm the lids on or store samples in hermetically sealed containers to minimize moisture transfer.