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**Dimensions:** 8.5 inch wide, 11 inch tall

**Material:** Paper, 92 Bright White or better, 75g/m<sup>2</sup> or heavier

**Colors:** Color Print on White

**Printer:** HP Color LaserJet 5550-PSC

**Finish:** None

**Adhesive:** None

**Special Notes:** Illustrations are Ref Only \*\* Not to Scale \*\*

**DECAGON DEVICES** Application Note

### Water Activity and Spices

**Introduction**  
Spices are defined as products derived from vegetable or animal sources that are free from other natural and are used to provide flavoring, seasoning, and aroma to foods (Petro 2002). In general, it is so long that it is used to match or alter the quality of a thing such as the taste or aroma of foods to make a more desirable. Spices also have other beneficial qualities such as being strong antioxidants.

Spices are conventionally classified as hot, mild, aromatic, and herb. Herbs are defined as being derived from the leaves of a plant while spices are taken from all parts of a plant other than the leaves. Common spices include cayenne pepper, black pepper, paprika, and cinnamon. Common herbs include basil, dill leaves, rosemary, and thyme.

Spices have been used and traded for thousands of years. They have traditionally been processed and traded as dry particles, usually stored by the sun (Shigehiro and Choi 2001). The quality indices of spices are based on color, germination, solubility, and sensory performance. Standards are set by the American Spice Trade Association (ASTA) and the European Spice Association (ESA). ASTA and ISO (International Organization for Standardization) standard testing procedures are recommended for spice manufacturers and United Analytical and Clinical Control Panel (UACCP) program for their quality assurance system.

**Moisture Analysis in Spices**  
ASTA and ESA list both moisture content and water activity as necessary moisture measurements, however only moisture content values are specified in the standards while water activity specifications should be agreed upon between the buyer and seller. Conventionally, water activity is considered a critical control point for HACCP plans while moisture content is not. Water activity and moisture content are complementary and together provide a complete moisture analysis. However, it is critical to understand the differences between the two measurements and their role in the safety of foods.

The terms moisture content and water content are often used interchangeably and represent a measure of the quantity of water in a product. Moisture content provides valuable information about yield and economic ranking, it is important from a financial standpoint. In addition, moisture content provides information about water vapor molecular weight of moisture provide water activity and lower the glass transition temperature. It however does not provide information about microbial safety.

Water activity (a<sub>w</sub>) represents the energy ratio of water in a system. It is equal to the relative humidity of the air in equilibrium with a sample in a sealed chamber. It is defined as the vapor pressure of water in a sample divided by the vapor pressure of pure water at the sample temperature.

Water activity, not moisture content, predicts safety and stability with respect to microbial growth, chemical and biochemical reactions, and physical properties. Figure 1 shows stability as a function of moisture content, time, and rate of degradation reactions as a function of water activity. By measuring and controlling the water activity, it is therefore possible to predict which microorganisms will be present, control of product and addition, to maintain the chemical stability of spices. It optimizes the physical properties of dry spices such as texture and flow properties. Recent publications stated that if their dried spices would preserve them and control their shelf life. They did not realize that the preservation was the result of lowering water activity.

**WATER ACTIVITY - STABILITY DIAGRAM**

Figure 1. Water activity stability and using the rate of water degradation reactions that water shelf life to water activity level.

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