Simple method for measuring SAFE Seed & Grain Storage Conditions

by Tracy Hmielowski

Checking the ambient humidity conditions of maize drying in the field in Guatemala. The pink color of the Humidicator paper shows that the humidity is too high for adequate drying under ambient conditions and that additional drying is required prior to storage.

Proper storage conditions are essential for maintaining the viability of seeds and safety of dry goods. The seed viability period during storage can be cut in half for each 1% increase in moisture content or 6°C increase in temperature. Fungal growth and pests are also associated with warm, moist conditions, and it is estimated that one-third of crop production is lost to poor storage in the humid tropics.

Optimal seed and commodity storage is cold and dry, conditions that are difficult to achieve in the humid tropics. Cold storage requires electricity, something that may not be easy to access in rural communities. Drying is a common method for seed and commodity preservation, but it can be difficult to accurately measure seed moisture content in the field.

An article recently published in *Agricultural & Environmental Letters* focuses on the relationship between seed moisture content and relative humidity and describes a simple way to measure the relative humidity of these products.

“The conversion from humidity to moisture depends on the oil content of the seed,” explains Kent Bradford, Distinguished Professor of Plant Sciences at the University of California–Davis (UC-Davis) and co-author on the article. The article includes links to tools that do these calculations for many seeds and grains. And while these calculations are useful for knowing the moisture content, when it comes to safe seed storage, “if you go by humidity, they all need to be stored at 20 to 30% for extended lifetime,” Bradford says. “For grains, the primary goal is to store below 65% relative humidity, which prevents mold growth and associated mycotoxin accumulation.”

There are a variety of ways to measure relative humidity, including meters and relative humidity indicator paper. In addition to being a method for measuring humidity to estimate moisture content, the indicator paper can be a quick visual assessment to test moisture content in the field, based on color.

“If you want to only make sure that your seeds are safe—whenever it’s blue, you’re good—when [it’s pink], you know that you need to do something to [reduce the moisture to] make sure that grain or that seed is not going to have problems,” says Pedro Bello, a researcher at UC-Davis and co-author of the article.

Bello demonstrated the use of the relative humidity paper in a recent trip to Guatemala. He visited a community...
seed bank where farmers store their seeds. Placing indicator paper strips in containers with the stored seeds, he found many “deposits” outside of the safe humidity range. It appeared that seeds may not have been sufficiently dried before storage or containers were not well sealed to keep humid air out. Using this simple and inexpensive method to monitor seeds could improve seed viability for farmers in this community.

Bradford also describes “practices in Nepal where the most common thing people do with seed or grain is just air-dry it.” People will spread seed out during the day to dry and then pile and cover it at night, repeating this process for many days. “They don’t really have a good way of knowing when they’re done or when you’ve really come to equilibrium and are expending extra effort for no benefit,” he says. By using indicator paper, they would know when the seed or grain had reached the point of being safe to store or that additional drying is needed after air-drying.

The ideas about moisture content and relative humidity from this research fit into a larger project to develop a “dry chain” for seeds and commodities analogous to the “cold chain” system used for fresh produce. By using ceramic “drying beads” that trap moisture along with waterproof packaging, people in the humid tropics could dry, transport, and store seeds and commodities through the value chain without the need to invest in cold storage. “Keeping that [low] moisture is very important,” Bello says, “so you have to make it dry and you have to keep it dry.”

“We really have to get the concept out there that the humidity is the enemy, and you’ve got to protect from it,” Bradford says. Educating people about humidity and moisture content and providing this simple tool to measure storage conditions could have a significant impact in reducing commodity loss.