MEASURING DRYNESS WITH THE DRYCARD™

(Training Facilitator Manual)

Objectives

By the end of this training, participants will have:

1. Discussed the importance of ensuring product is dry enough to store
2. Assessed common methods to tell if product is dry enough to store
3. Observed and learned how to use DryCard™ to check product dryness

PREPARATION/MATERIALS

- DryCards, enough for each participant to have one
- Dried product such as maize, rice, coffee beans, or chilies to test dryness
    - Have product at different moisture levels in separate containers with DryCards for reference (i.e. one at 35%, one at 55%, and one at 75%)
    - Have examples of moldy or spoiled product with DryCards
- Paper and writing utensils

TIME

30 minutes

STEPS

1. Discuss the importance of sufficient dryness to stop mold growth and assess common methods to tell if product is dry enough to store – 15 minutes
2. DryCard demonstration and Q+A – 15 minutes

REFERENCES

- Text from Deltsidis, A., Aalia, K. B., Reid, M., Thompson, J., Mitcham, E., Hansen, B., … Jarman, A. (2018). Chimney Solar Dryer Manual. Retrieved from https://horticulture.ucdavis.edu/information/chimney-solar-dryer-manual
- Text from Horticulture Innovation Lab. (2018). Dry Card. Retrieved September 25, 2018, from https://horticulture.ucdavis.edu/drycard

STEPS

1. **Discuss the importance of sufficient dryness to stop mold growth and ways to tell if product is dry enough to store – 15 minutes**

At the beginning of this session, select a small sample of dried product that is above 65% relative humidity and place the product in a clean, separate airtight container (ideally a clear container for demonstration purposes later). Place a DryCard in the container with the dried product and seal the container. Make sure to show the participants the color of the DryCard at the beginning of this session (consider have someone say the starting card color out loud for all to hear).

Say:

> *We will come back to this product later in the training. Now, we are going to think about and discuss the importance of making sure product is dry enough to store. Turn to the person next to you, and use the next 5 minutes to take turns describing and sharing your thoughts on the following questions:*
>
> - **In your experiences drying fruits and vegetables, how do you know if a product is dry enough to store? What method do you use to assess dryness?**
> - **Have you had any problems or challenges with determining if a product is dry enough to store?**
> - **If a product becomes moldy in storage, what do you think is causing the mold growth?**
> - **Why is mold growth a problem?**
> - **How can we solve the problem of mold on dried product?**

*After 5 minutes, ask for volunteers to share their discussions, and **take notes on their responses for evaluation purposes**. Add any of the following points that are not raised:*

> *The moisture content of fresh produce at harvest ranges from 20-95%. Crops must be sufficiently dried to be safely stored, otherwise harmful fungus/mold will develop. Moldy food can have a bad taste and may be contaminated with harmful toxins, which make it a health hazard to consume.*

Depending on which products participants plan to dry in the future, you should make the following specific recommendations and demonstrate by bending, biting, crushing, or listening to the product rattle in a container. After demonstrating each product, you should pass around a small piece of each product with different levels of relative humidity to the participants so they can try to test for dryness using one of the common methods.

For your reference:

Recommendations: How dry is dry enough?

- High sugar content fruit should be dried to approximately 20% moisture content; this means that the fruit will still be pliable/bendable/flexible, but not sticky or tacky.
- Dried berries should rattle when shaken in a container.
- Vegetables are sufficiently dried when they are hard and brittle or tough and leathery, depending on the vegetable.
- Sufficiently dried beans, corn and peas are hard and can shatter.
- Dried leafy, thin vegetables should be brittle and will easily shatter or be crushed into powder, and larger chunks or slices of vegetables should be leathery. At this stage, the produce should contain about 10% moisture.

[Assessment] Participants should bite, bend, rip, or crush the sample product to test if it's dry enough to store. Ask participants: Do you think it is dry enough to store? Is it hard to determine? Do you think your guess is accurate?

2. DryCard demonstration and Q+A – 15 minutes

After demonstrating and passing around each product, say:

> *You can also tell that a product is not dry enough to store if you place it in a sealed container and see condensation/moisture start to develop.*
>
> *However, the best and most accurate method of determining safe product for storage is to measure the relative humidity of the air in the dried product storage container. Mold will not grow when relative humidity is lower than 65%.*
>
> *One inexpensive method for measuring relative humidity is to use a DryCard™ indicator (more information at http://drycard.ucdavis.edu/). The DryCard™ is an inexpensive device developed by researchers at the University of California, Davis to determine if dried food is dry enough to prevent mold growth during storage.*
>
> *The DryCard is a reusable device that works by incorporating a cobalt chloride humidity indicator paper strip that changes color with changing relative humidity. When a dry product is stored in a sealed container, mold will not grow on it if the relative humidity within the container is lower than 65%.*

Hold up the DryCard to show participants, then pass it around so participants can look at it. Say and demonstrate the following, on a new sample of dried product:

> *To use the DryCard to check dryness, place the DryCard and a sample of the dried product in an airtight container, such as a sealed plastic bag or a jar. The*

card will display an estimate of the relative humidity within the sealed container in approximately 30–60 minutes. Waiting for 2 hours will provide a more accurate measure. If the paper indicator strip on the card turns pink, then the product is too wet for safe storage. If the paper strip turns blue or mauve, then the product is adequately dried. If the DryCard turns pink, this indicates the product is too wet to be stored safely, then the product should be consumed immediately or dried further before storage. If available to you, you can use the DryCard reader with the cut-out window to more clearly match the color to the relative humidity level, based on the RH scale on the card.

Hold up a few clear containers with DryCards and samples of dried product from the beginning of the session to show any color change, as well as the additional dried product (including the moldy or spoiled samples). Pass around these containers for participants to observe the color on the DryCard.

Ask participants:

- **What is the color of the DryCard in these containers?**
- **Has the color of the DryCard changed from the beginning of the session?**
- **What do you think the color change indicates?**
- **Do you think the product is dry enough to store based on the color of the DryCard now?**

Acknowledge responses, and explain if the products are dry enough to store based on the DryCard reading. Be sure to point out how the color of the paper strip can be read based on the color scale with the different relative humidity values and highlight the cut off line at 65% RH. If available, use the DryCard reader to assist with the demonstration.

When you show containers with DryCards and samples of product (e.g. tomatoes) divided into different containers based on levels of relative humidity (some products should be above 65% and others below, including the moldy or spoiled product), remove each product from its container, pass it around and state the level of relative humidity according to the color on the DryCard. Have participants observe and feel each product to understand different levels of dryness for future reference. The goal is to show people that there is a spectrum of dryness, and even partially dried product without mold or visible signs of spoilage may not be safe to store for later consumption.

Ask participants:

- **I want to know how much each of you is understanding these concepts. Close your eyes and show me how much you understand by holding up 1-5 fingers. One finger means you do not understand at all and five fingers mean you understand completely.** *You should record different responses for evaluation and improvement purposes.*

- **What questions do you have about the DryCard or how to know if product is dry enough to store?** *You should record people's questions for evaluation and improvement purposes.*

Say:

A DryCard can be reused many times if well cared for. Store the card in a plastic bag to prevent accidental contact with water or high humidity conditions (near 100% relative humidity), which will stop the card from working properly. The indicator strip contains cobalt chloride. Do not remove the strip from the card or leach the cobalt chloride by placing it in water, which will ruin the card.

Share contact information for DryCards.

Conclude Training on Measuring Dryness of Product