Mango Model Building Standard Operating Procedure (SOP)

Mango Model Building SOP at One Temperature

The following procedure outlines the process of creating a model on the F-750 device for dry matter and TSS (Brix) with mangos. This SOP is also available at https://felixinstruments.com/support/F-750/. This SOP outlines the process for building a model with room temperature fruit only. The Standard Operating Procedure for including multiple temperatures can be found in the following section.

I. Getting prepared for model building

Equipment needed:

- ♦ Fruit
- ♦ Permanent Marker(s)

1. Select specimens of fruit with a wide range of maturity to be used in training set creation and label each with a specimen number. (Note: if both sides of the fruit are to be scanned label each side as their own sample #, i.e.; mango 1 will be samples 1 and 2, mango 2 will be samples 3 and 4 and so on.)

II. Preparing the F-750

Equipment needed:

- ♦ F-750

1. Turn on the F-750 and navigate to the Setup Menu > Training Sets > Create New Training Set.
2. Enter a name to use for the new training set using the up and down arrows to select characters and press the right arrow to enter (pressing the right arrow twice moves to the next menu.)
3. Enter the number of specimens that will be used to build the model (minimum of 40 specimens, recommended ~200 specimens.) Press the right arrow again to create the training set file. Be aware this step can take a few minutes, and very large training sets (1000+) can take up to an hour to process.
4. After the training set has been created, press the right arrow to enter the Browse Specimen Data menu. Navigate to the mid temperature option for making your model with room temperature fruit.

Now we will begin scanning each specimen.

III. Scanning Fruit

Equipment needed:

- Permanent Marker(s)
- F-750

1. Place the first specimen on the fruit adaptor of the F-750 and use a permanent marker to mark the area to be scanned.

2. On the F-750 with Specimen 1 highlighted on the list, press the right arrow to collect the training spectra. The instrument will indicate "Processing". **Do not press the scan button to gather training set spectra.**
3. After each specimen has been scanned, you will see a date and time included in the specimen file name. (Note: Specimens can be re-recorded if a mistake is made or the wrong specimen/temperature is selected.)
4. Repeat for all specimens at the Mid Temperature.

You are now finished creating your training set. The same specimens used for training set creation will now be used to collect reference values for building a predictive model.

### IV. Collecting Dry Matter Reference Data

Equipment Needed:

- Paring knife
- Cutting board
- Circular corer
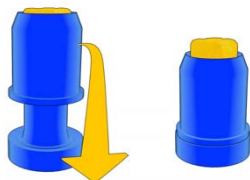- Microbalance
- Food dehydrator(s)

1. Remove the fruit skin from the area which was marked and scanned with the F-750 with a sharp knife being careful to fully remove the skin ONLY, taking care to remove as little tissue under the skin as possible.

2. Push the 26mm circular corer to the seed of the mango in the prepared area.
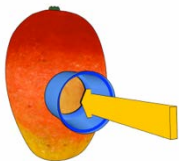
3. Remove the corer and slice the mango close to the seed removing the core of sampled

   mango.
4. Trim the mango core on the seed side, so the total height of the cylinder is 2cm.

5. Weigh the sample in a microbalance immediately and record the weight to the nearest .001 grams. The expected wet mass should be around 10-12 g.
6. Dry the samples in a dehydrator for 48 hours set at 63-65°C.
7. After 48 hours, re-weigh a few of the samples and record the values. Replace the samples back into the dehydrator.
8. Re-check the same samples a couple of hours later and see if they have changed in weight, if they have not you can assume they are fully dehydrated.
9. Measure all samples one at a time in a microbalance and record the values.
10. Divide the final (dry) weight from the initial (wet) weight for each sample to determine the Dry Matter.

IV. Collecting Brix/SSC Reference Data

Equipment Needed:

- ♦ Paring knife
- ♦ Cutting board
- ♦ Circular corer
- ♦ Digital Refractometer
- ♦ Garlic Press/cheese cloth

1. Ensure fruit and refractometer have equilibrated to the same temperature.
2. Remove the fruit skin from the area which was marked and scanned with the F-750 with a sharp knife being careful to fully remove the skin <u>ONLY</u>, taking care to remove as little tissue under the skin as possible.

3. Push the 26mm circular corer to the seed of the mango in the prepared area.
4. Remove the corer and slice the mango close to the seed removing the core of sampled mango.
5. Trim the mango core on the seed side, so the total height of the cylinder is 2cm.
6. Load the sample core into the garlic press or cheese cloth
7. Holding the press over the refractometer, apply pressure until several drops of juices have covered the quartz optical sensor of the refractometer.
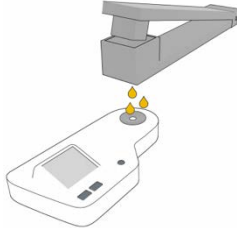
8. Press the scan button and record the value
9. Press the scan button again to ensure the refractometer has given a stable reading
10. Wipe and dry the refractometer
11. Repeat process with the next specimen.
12. It is useful to occasionally check the zero of the refractometer with DI water.

Mango Model Building SOP with Multiple Temperatures

I. Getting prepared for model building with fruit at multiple temperatures

Equipment needed:

- ♦ Environmental chamber at temperature
- ♦ Fruit
- ♦ Permanent Marker(s)

1. Select specimen of fruit with a wide range of maturity to be used in training set creation and label with a specimen number. (Note: if both sides of the fruit are to be scanned label each side as their own sample #, i.e.; mango 1 will be samples 1 and 2, mango 2 will be samples 3 and 4 and so on.)
    a. If amending a previous model, the number of specimen used should be approximately 20% of the number of specimen used to build the original model. For example, if the original model built was with 60 specimens, use 12 specimens to build this training set.
2. Determine the three temperatures to be used for the training set (Minimum, Mid, and Maximum.) It is best to choose a range of temperatures encompassing the range which the measurements will be taken in the field, for example, 10°C, 20°C, 30°C.
3. Place the fruit in a temperature controlled environmental chamber (a temperature controlled room will work.)
4. After the fruit has been given enough time to come to the pre-determined temperature (generally about one hour.) It is now time to begin taking measurements for the training set.

II. Preparing the F-750

Equipment needed:

- ◆ F-750

5. Turn on the F-750 and navigate to the Setup Menu > Training Sets > Create New Training Set.
6. Enter a name to use for the new training set using the up and down arrows to select characters and press the right arrow to enter (pressing the right arrow twice moves to the next menu.)
7. Enter the number of specimens that will be used to build the model (minimum of 40 specimens, recommended ~200 specimens.) Press the right arrow again to create the training set file. Be aware this step can take a few minutes, and very large training sets (1000+) can take up to an hour to process.
8. After the training set has been created, press right to enter the Browse Specimen Data menu. Navigate to the mid temperature option for making your model with room temperature fruit.

Now we will begin scanning each specimen.

III. Scanning Fruit

Equipment needed:

- ◆ Permanent Marker(s)
- ◆ F-750

5. Place the first specimen on the fruit adaptor of the F-750 and use a permanent marker to mark the area to be scanned.

6. On the F-750 with Specimen 1 highlighted on the list, press the right arrow to collect the training spectra. The instrument will indicate "Processing". **Do not press the scan button to gather training set spectra.**
7. After each specimen has been scanned, you will see a date and time included in the specimen file name. (Note: Specimens can be re-recorded if a mistake is made or the wrong specimen/temperature is selected.)
8. Repeat for all specimens at the Minimum Temperature.
9. After all specimens have been recorded at the Minimum Temperature, place the specimens back in the temperature controlled area to bring the fruit to your next selected temperature: Mid temperature.

10. After specimens have reached the desire Mid temperature, the next set of temperature data is ready to be collected.
11. If you have turned off the F-750 while waiting for the specimens to reach their next temperature, navigate to the Setup Menu > Training Sets > Modify Existing Training Set and select the training set you created previously.
12. Within your training set file go to Browse Specimen Data and navigate to the Mid Temperature folder. Place the first specimen on the fruit adaptor and align with previous scan location markings, and with Specimen 1 highlighted on the list press the right arrow to collect the training spectra.
13. Repeat for all specimens at Mid temperature. (Note: You will be using the same specimens for all three temperature sets so the specimen must be scanned in the same order and at the same location as was done for the Minimum Temperature.)
14. Repeat the previous steps for the Maximum Temperature when the specimens are at the selected temperature.

You are now finished creating your training set. The same specimens used for training set creation will now be used to collect reference values for building a predictive model.