

# Ma'afala Breadfruit: When to Harvest?

Breadfruit has culinary uses in various stages of maturity, but breadfruit intended for commercial marketing is best picked when the fruit is fully formed but has not yet started to ripen, commonly referred to as "mature." At this point, the fruit has reached its maximum size, firmness, and starch content, but before when the flesh softens and sweetens as the starch breaks down into sugars. Harvesting at the appropriate maturity maximizes yield and helps maintain fruit quality from farm to market. A maturity index helps identify when the quality of a fruit is sufficiently mature to be harvested.



We studied how various traits in the Ma'afala breadfruit cultivar changed during the final stages of its development and found that the intersegment space between segments of the color and skin are the best indicators of Ma'afala maturity. The color of the intersegment space refers to the color of the lines between the polygons on the surface of the breadfruit (Figure 1). In a mature Ma'afala breadfruit, at least half of the intersegment spaces are not green. The skin color was a reliable but subtle indicator of maturity. A well-trained eye or electronic color-sensing tool is needed to judge maturity based on skin color. Useful color-sensing tools include Canopeo, a free app for Apple and Android phones that determines the green percentage of a photo, or a colorimeter that digitally measures the color of the skin. A mature Ma'afala breadfruit will measure less than 50% green on Canopeo, and using a colorimeter, a mature fruit will have an average  $L^*a^*b^*$  reading of  $a^* > -7.5$ ,  $b^* < 39$ ,  $L^* < 62$ . Breadfruit such as Ma'afala tends to have suitable maturity for the last two weeks of its development before it begins to ripen.

In our experience, Ma'afala breadfruit maturity was not reliably indicated by the presence of latex on the skin, color of the peduncle, or size of the fruit (Figure 2). Sometimes latex drops were present on the skin before the fruit was mature and sometimes no latex was present, even when the fruit was completely ripe. The peduncle color changed in the last moment of development, when the fruit was on the verge of ripening, so waiting for the peduncle to turn

before you pick the fruit may result in a fruit that ripens too quickly. The size was impacted by many factors, so some breadfruit will remain small as the fruit matures. Although latex, peduncle color, and size change during breadfruit development; they are not reliable indicators of maturity in Ma'afala breadfruit.

There are many factors to consider when picking a breadfruit. The maturity index we suggest is limited to the Ma'afala variety and has not been validated in various growing conditions. In our study, we used the starch and sugar content to approx-

imate the eating quality of breadfruit, but the relationship between maturity and eating quality, as judged by a consumer, remains unclear. Using a consistent and accurate maturity indicator to determine when breadfruit are ready to be harvested can help improve breadfruit marketing.

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## References

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Wiseman, B., R. E. Paull, N. K. Lincoln and M. Wall. 2023. 1-methylcyclopropene and Harvest Maturity Impact 'Ma'afala' Breadfruit Postharvest Storage. *HortScience* 58(6) 666-670. <https://doi.org/10.21273/HORTSCI17076-23>

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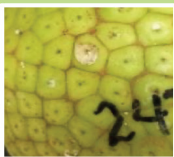
## Figure 1. Useful maturity indexes for Ma'afala

### Intersegment Space Color

Breadfruit are mature when at least half of the spaces between the skin segments are brown.



mostly green means not mature



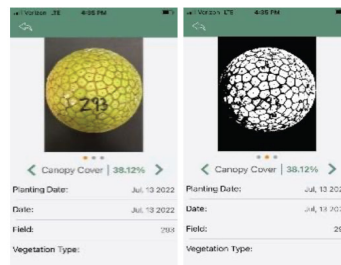
mostly brown means mature

### Color Sensing

Breadfruit are mature when photo green fraction is less than 50%.



#### Canopeo



Situate breadfruit in photo frame so that the widest point of the breadfruit is spanning the photo width.

### Color Sensing

A colorimeter can objectively sense a subtle color change.

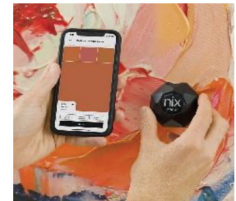


photo nixsensor.com

Breadfruit are mature when the average color  $L^* a^* b^*$  values are  $a^* > -7.5$ ,  $b^* < 39$ ,  $L^* < 62$ .



not yet mature



mature



mature

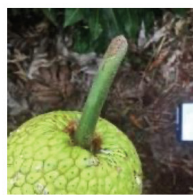
## Figure 2. Less reliable maturity indexes for Ma'afala

### Latex on Skin



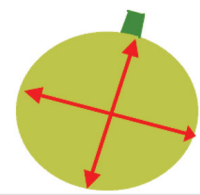
Latex may appear before maturity or never appear.

### Peduncle Color



The peduncle color changes after the fruit is mature, when the fruit is on the verge of ripening.

### Size



Size is impacted by many factors. Some fruit may remain small at maturity.