

# Why is Archaeological Little Barley Naked: A Carbonization Experiment

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## Introduction

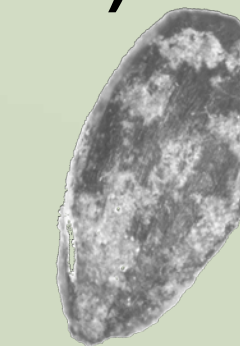
Little barley (*Hordeum pusillum*) is typically found carbonized and without chaff in the archaeological record. Carbonization is the transformation of an organic material into a carbon substance through elevated temperatures, and chaff are the inedible plant parts encasing the seed. In the case of little barley, the chaff is not easily removed, particularly the hull (palea and lemma), yet these plant parts are not observed in the archaeological record. This could mean there was an ancient domesticated variety that was selected for “naked” grains which would allow for easy processing. We wanted to know if the absence of chaff in the archaeological record could be the result of burning. In this experiment, we burned different types of little barely seeds to understand if the chaff could be removed by carbonization. There are three main parts of little barley that we analyzed, the fruiting body (the seed and other parts that help it plant itself), the palea and lemma (floral parts surrounding the grain), and the caryopsis (grain).

## Methods

- Seeds grown in Ithaca, NY processed to form three groups: fruiting body, grain with palea and lemma intact, and grain (caryopsis) only.
- Used a Dino-Lite with DinoCapture 2.0 software to take photographs of 20 samples of each grain
- Measured each individual grain using ImageJ software
- Experimentally carbonized the grains by burying them in sand-filled crucibles and placing them in an oven at 450° F for 3 hour and 6 hour increments
- Removed grains and took pictures of the carbonized results
- Measured the carbonized grains using ImageJ



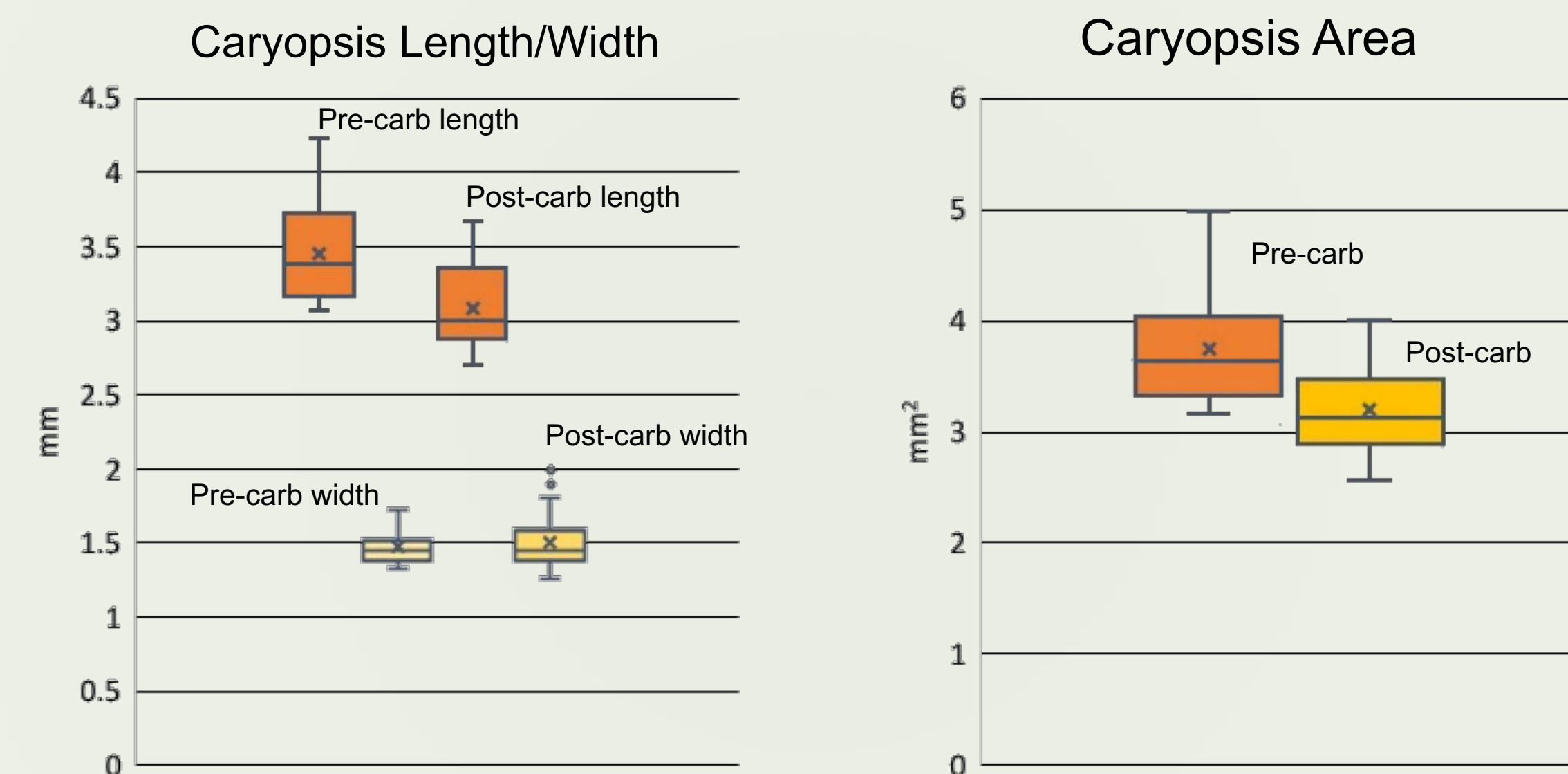
Sand-filled crucible container that held the grains when placed in the oven



Archaeological little barley caryopsis.

## Carbonization Experiments

### Caryopsis Comparison of Size



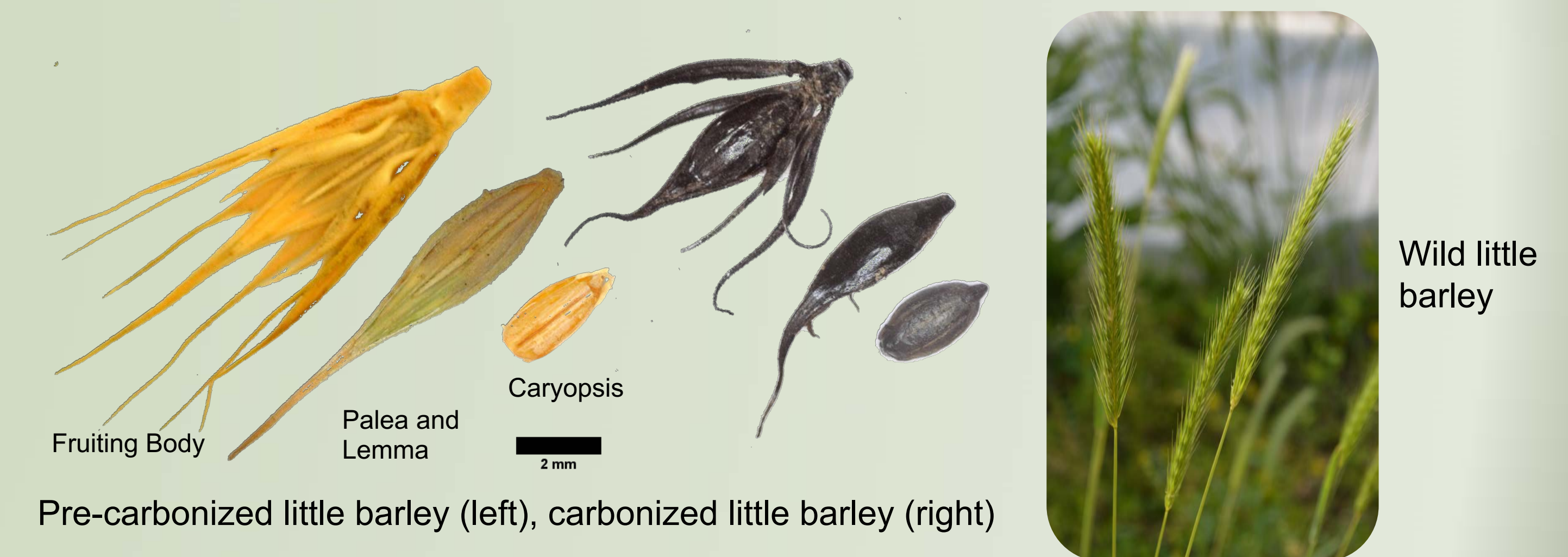
### Area Comparison



Size decreased significantly due to carbonization across categories of different parts of the grain as well as length and width versus the area.

## Results and Conclusion

- **Results:** We found that the grains did carbonize in both durations of 3 hours and 6 hours, however, in neither scenario was any part of the chaff removed or burned away.
- **Conclusion:** Since the chaff was not removed during carbonization, there could have been a domesticated variety that either had no chaff or allowed for easy removal. The little barley could also have been culturally processed in other ways in which the chaff was removed prior to usage or consumption.



## Future Endeavors

For future experiments we could attempt various processing techniques to explore if one could efficiently remove all of the chaff. For example, employing both burning and common preparation techniques such as soaking and abrading. We could also further explore the possibility of an ancient domesticate of little barley as the answer to why we only find “naked” grains in the archaeological record.

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