# CALIFORNIA SCIENCE & ENGINEERING FAIR
## 2019 PROJECT SUMMARY

**Name(s)**

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**Project Number**

**J1325**

**Project Title**

# The Effect of Water on the Strength of Retted Fiber

**Abstract**

**Objectives**

Our goal was to find the optimal retting conditions for the outer layer of flax to break with the least force in order to accelerate production. We hypothesized that if increased moisture has an effect on retting speed, then the outer shell soaked in the highest amount of water should be weakest.

**Methods**

Equal amounts of flax were cut and distributed among bins with different volumes of water: 150mL, 400mL, and 650mL, and a control without water. A mixture of distilled water, kelp fertilizer, and Bacillus subtilis was used to simulate retting in lake waters. Fibers retted for one week and then were bleached to remove excess bacteria before drying. The strength of each fiber sample was tested by hooking it onto a Vernier force sensor and pulling until it broke while recording the force exerted.

**Results**

Samples that received no moisture were significantly harder to break than those placed in shallow water, and fibers that were completely soaked also required less force than those in little water. The control required an average force of 64.14 N to break, the 150mL needed 48.99 N, 400mL required 34.59 N; and the 600mL fibers needed 32.23 N. The contrast between samples at 400 mL and 650 mL was an insubstantial 6.8%. These conditions allowed for submersion of the samples and the data suggests that as long as fibers are totally wet, adding additional water is not necessary.

**Conclusions**

Our hypothesis was correct. Water retting, where fibers are completely soaked, is more efficient than dew retting, when only limited moisture is present, with a 29.4% decrease in force needed. Therefore, the benefits of water retting outweigh its potentially higher costs. Additionally, water retting does not have to be done in excess: as long as fibers are completely submerged, using higher quantities of water is unnecessary. Hence, flax farmers should switch to water retting, even if large bodies of water are not available.

**Summary Statement**

We found the optimal amount of retting water for flax fibers in an effort to lower the cost and time of producing linen; our results showed that water retting is most efficient, but excess water after the submersion of fibers is unecessary.

**Help Received**

Our project advisor prepared our bacteria culture and purchased all of our required materials. My partner and I came up with and performed the experiment ourselves.