The development of Sea Lettuce, *Ulva sp*., paper products: fiber and fatigue analyses

Ulva sp., also known as Sea Lettuce, is a green alga that is prevalent in macroalgal nuisance blooms. As a solution for profitable recycling, *Ulva sp*. could potentially be used in ratio with recycled wood pulp as a paper additive. The aim of the study was to determine whether increasing concentrations of *Ulva sp*., as well as additives, such as soda ash and liquid starch, affects the strength of handmade paper. Handmade paper samples consisting of different concentrations of *Ulva sp*. to wood pulp were blended then poured over a mold and dried. Folding fatigue and paper shrinkage were calculated and compared to industrial standards of tissue paper, parchment paper, Nori, and cardboard. There was a strong correlation between the paper shrinkage and increasing concentration of *Ulva sp,* with the no additive treatment having the largest shrinking rate. The liquid starch treatment was able to withstand the most folding fatigue in comparison to the no additives and soda ash treatments; however, all three treatments could not be folded more than 2-4 times when *Ulva sp*. concentration reached 100%. The 25% *Ulva sp*. concentration with soda ash additives and 75% *Ulva sp*. concentration with liquid starch would be the best applications for tissue paper purposes, while lower concentrations of *Ulva* for all additive tests would have multi-purpose applications ranging from artisan paper to possibly cardboard.