Salicornia bigelovii straw was characterized and evaluated as a potential lignocellulosic bioethanol feedstock. S. bigelovii used in the study was grown in the United Arab Emirates using saltwater (40 ppt) for irrigation. Salt removal was performed prior to pretreatment to protect the processing equipment and avoid inhibition of enzymes and yeast. Composition of the washed biomass was comparable to traditional lignocellulosic biomasses with relatively high glucan and xylan content (26 and 22 g/100 gDM, respectively) but with lower lignin content (7 g/100 gDM). The washed feedstock was subjected to hydrothermal pretreatment, producing highly digestible (up to 92% glucan-to-glucose conversion) and fermentable (up to 100% glucose-to-ethanol conversion) fiber fractions. Liquid fractions obtained in the pretreatment did not show inhibition towards Saccharomyces cerevisiae. No significant differences among the enzymatic convertibility and microbial fermentability of the fibers as well as low xylose recoveries suggest that lower severity pretreatment conditions could be exploited for S. bigelovii. © 2013 Elsevier Ltd.