The main four seaweed species for carrageenan production used in industry are Eucheuma denticulatum, Kappaphycus alvarezii, Chondrus crispus, and Sarcothalia crispata. In addition, a fifth red seaweed, Furcellaria lumbricalis, is a source of furcellaran, which is very similar to carrageenan. In this study, the chemical composition including total lipid, fatty acid profile, tocopherol content, total protein, amino acid profile, and total phenolic content of the five semi-dried industrial red seaweeds were analyzed. The obtained results indicated that when considering the total commercial production of carrageenan, there is potential to develop a method to extract protein before the main process for carrageenan extraction. Protein was the most considerable compound in the selected seaweed, and it varied from 4% for E. denticulatum up to 28% for F. lumbricalis. In the future, this may lead to a multi-product extraction (biorefinery) approach to result in more than one product instead of the traditional single-product procedure.