

Recovery of palm oil and valuable material from oil palm empty fruit bunch by sub-critical water

ABSTRACT

Oil palm empty fruit bunch (EFB) is one of the solid wastes produced in huge volume by palm oil mill. Whilst it still contains valuable oil, approximately 22.6 million tons is generated annually and treated as solid waste. In this work, sub-critical water (sub-cw) was used to extract oil, sugar and tar from spikelet of EFB. The spikelet was treated with sub-cw between 180-280°C and a reaction time of 2 and 5 minutes. The highest yield of oil was 0.075 g-oil/g-dry EFB, obtained at 240°C and reaction time of 5 minutes. Astonishingly, oil that was extracted through this method was 84.5% of that obtained through Soxhlet method using hexane. Yield of oil extracted was strongly affected by the reaction temperature and time. Higher reaction temperature induces the dielectric constant of water towards the non-polar properties of solvent; thus increases the oil extraction capability. Meanwhile, the highest yield of sugar was 0.20 g-sugar/g-dry EFB obtained at 220°C. At this temperature, the ion product of water is high enough to enable maximum sub-critical water hydrolysis reaction. This study showed that oil and other valuable material can be recovered using water at sub-critical condition, and most attractive without the use of harmful organic solvent.

Keyword: Oil palm empty fruit bunch; Oil recovery; Soxhlet; Sub-critical water