



Pyrolysis and combustion kinetics of date palm biomass using thermogravimetric analysis

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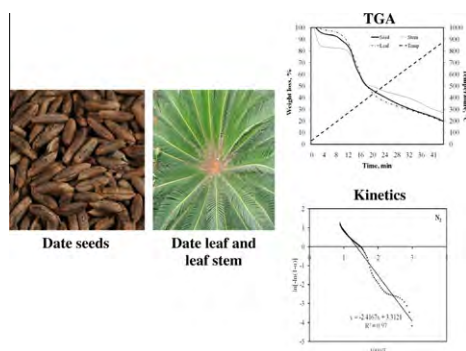
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HIGHLIGHTS

- First time the detail pyrolysis and combustion kinetics of date palm biomass was studied.
- Date seeds and leaf can become potential feedstock for bio-fuel and bio-char production.
- Stem showed low combustion and pyrolysis characteristics since it contains high moisture content.
- We assure that kinetic data of date palm biomass could be useful for thermo-chemical technology.

GRAPHICAL ABSTRACT



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ABSTRACT

The present research work is probably the first attempt to focus on the kinetics of pyrolysis and combustion process for date palm biomass wastes like seed, leaf and leaf stem by using Thermogravimetric Analysis (TGA) technique. The physical properties of biomass wastes were also examined. Proximate and ultimate analysis of the date palm biomass was investigated. FT-IR analysis was conducted to determine possible chemical functional groups in the biomass. Results showed that date palm seed and leaf can be characterized as high calorific values and high volatile content biomass materials as compared to the leaf stem. Kinetic analysis of this biomass was also given a particular attention. It is concluded that these biomasses can become useful source of energy, chemicals and bio-char.

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1. Introduction

Saudi Arabia and its surrounding regions are the home land of the date palm (*Phoenix dactylifera*) trees. Palm tree is perhaps one of the oldest trees in the world. Recent statistics showed that Saudi Arabia has about 23 millions palm trees, which produce about 780 thousand tons of dates per year (Al-Abdoulhadi et al., 2011). Dates have high nutrition values and provide excellent

health benefits. Each date provides about 20 calories, and is a good source of carbohydrate, fiber, and potassium, with smaller amount of calcium and iron along with other vitamins and minerals. Hence, large amount of dates are consumed as a dietary and its significance is published elsewhere (Ismail et al., 2006).

Annually a huge amount of date palm biomass waste is generated while processing date palm fruit. One more feature of the date palm leaf is that it does not fall from the tree even after getting dry. It stays attached to the date palm tree until it is removed manually. This preserves it from getting lost or wasted. However, excess amount of these date palm leaves can cause environmental hazards such as fire, bait for insects and diseases (Ali, 2008).

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