CHEMICAL AND BIOTECHNOLOGICAL STUDIES ON CASTOR OIL

By

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DEDICATION

I dedicate this work to whom my heartfelt thanks; to my mother, my brother, my mother ferial zaher,prof at the fats and oils department,NRC for their patience and help and to friends for all the support they lovely offered along the period of my post-graduation

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ABSTRACT

This thesis aims at investigating the chemical as well as the biological properties of castor oil produced by extraction of castor beans of castor trees irrigated by semi treated sewage water in Aswan city, Egypt .It also aims to assess the potential of the oil as a biomass for the production of biofuel that can be used as an alternative to regular petrol fuel. Therefore, this thesis comprises two main sections, the first concerns with the chemical and biological properties of castor oil as well as the major fatty acid in the oil which cauld be obtained via hydrolysis of the oil triglycerides,ricinoleic acid.The second section ,on the other hand concerns with the potential of castor oil as a biomass for the production of biofuel that can be used as an alternative to regular petrol fuels .

In the first section, the chemical and physical properties of the oil have been determined and evaluated. In addittion the antimicrobial as well as the anticancer activity of the oil as well as ricinoleic acid have been studied. The results showed that castor oil is less effective as antimicrobial agent than ricinoleic acid while the reverse is true regarding their effects as anticancer agents .It has been also proved that both of ricinoleic acid and castor oil are more effective as anticancer agents on liver cancer than that on colon and breast cancer.

In the second section, biodiesel was prepared from castor oil by transesterification reaction with methyl alcohol using sodium methoxide as a catalyst as well as sulfuric acid.Biofuel was also prepared from castor oil by thermal cracking of castor oil at 250 ºC using sodium carbonate as catalyst.The prepared biofuels have been then evaluated as alternative fuels to diesel engines according to their fuel properties as compared to regular diesel fuel as well as the performance characteristics of a diesel engine when running using the prepared biofuels as compared to the engine performance using regular diesel fuel. The brake power and the fuel consumption rates were obtained for each fuel and hence the specific fuel consumption as well as the thermal efficiency of the engine were estimated and compared to those using solar at different engine loadings.Biodiesel prepared by transesterification of castor oil with methanol has properties suitable for its use as alternative fuel to diesel engine. Blending petrol diesel with 10% biodiesel improves the thermal efficieny of the engine.However, thermal catalyzed cracking of castor oil produces a fuel of low flash point that makes it unsuitable for use in diesel engine based on safety considerations.

Key words: Castor oil; transesterification; thermal cracking; biodiesel; fuel properties; engine test, antitumor, antimicrobial

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