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## RSM and Artificial Neural Networking based production optimization of sustainable Cotton bio-lubricant and evaluation of its lubricity & tribological properties

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### Abstract

Depletion of mineral reservoirs along with health and environmental concerns have led to a greater focus on bio-lubricants. The purpose of this study was to analyze and optimize the reaction conditions of the transesterification process for cotton biolubricant synthesis by using Response Surface Methodology (RSM). In RSM, Rotatable central composite design was selected to examine the effect of reaction input factors on the yield of cotton bio-lubricant during the transesterification process. ANOVA analysis showed that temperature was the most significant factor followed by time, pressure and catalyst-concentration. Optimum reaction conditions obtained by RSM for maximum TMP tri-ester (cotton bio-lubricant) yield of about 37.52% were 144 degrees C temperature, 10 h

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time, 25 mbar pressure, and 0.8% catalyst-concentration. RSM predicted results were successfully validated experimentally and by artificial neural networking. About 90%-94% cotton seed oil bio-lubricant was obtained after purification and its physiochemical, lubricity and tribological properties were evaluated and found comparable with ISO VG-46 and SAE-40 mineral lubricant. Hence, cottonseed oil is a potential source for the bio-lubricant industry. (C) 2021 The Authors. Published by Elsevier Ltd.

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**Author Keywords:** Cotton biolubricant; Trimethylolpropane; Transesterification; Optimization; RSM; ANN

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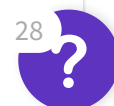
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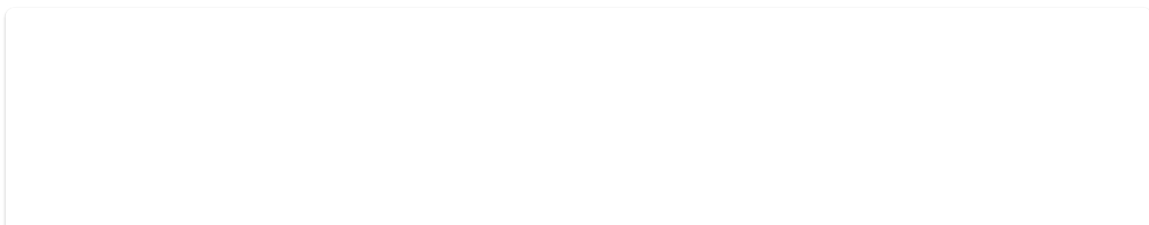
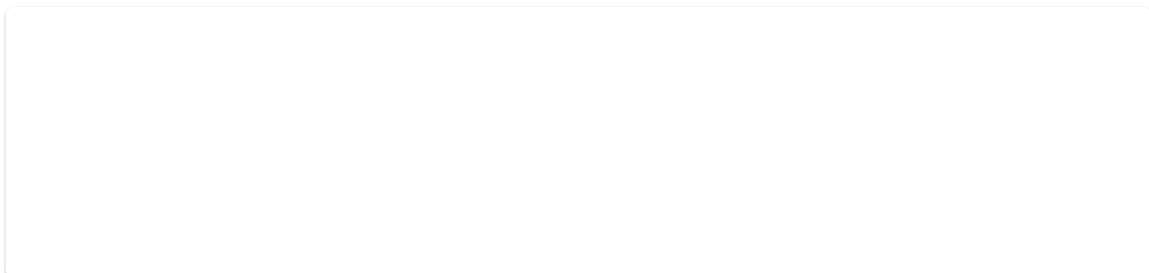
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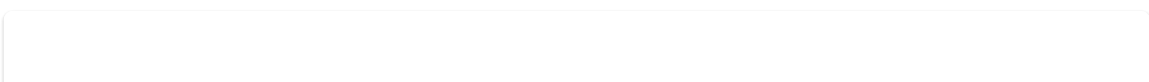
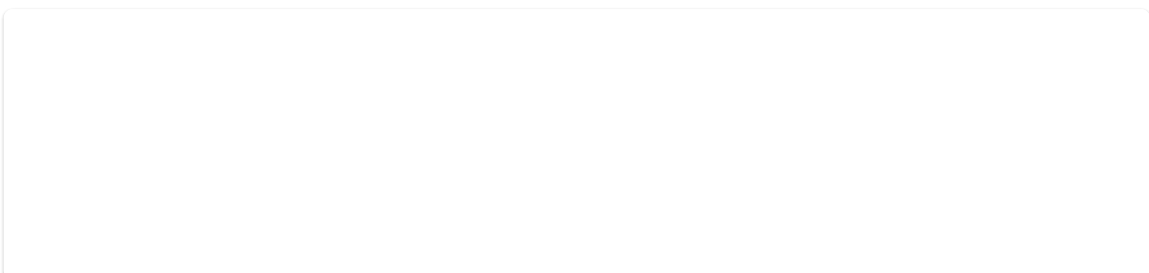
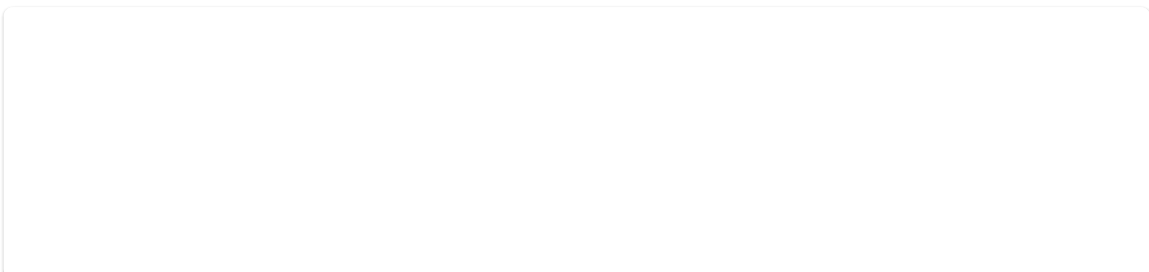
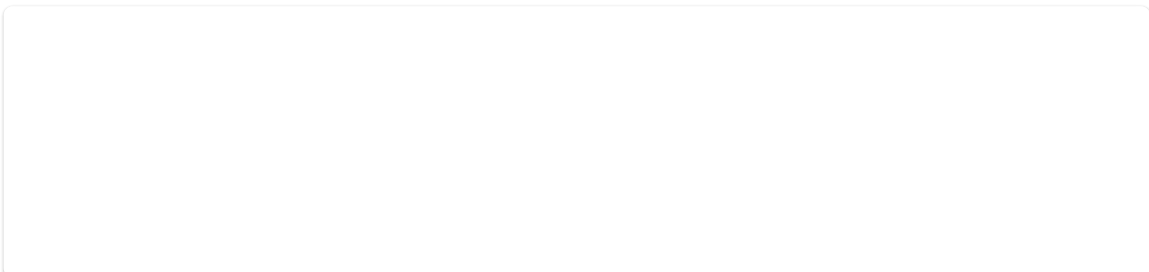
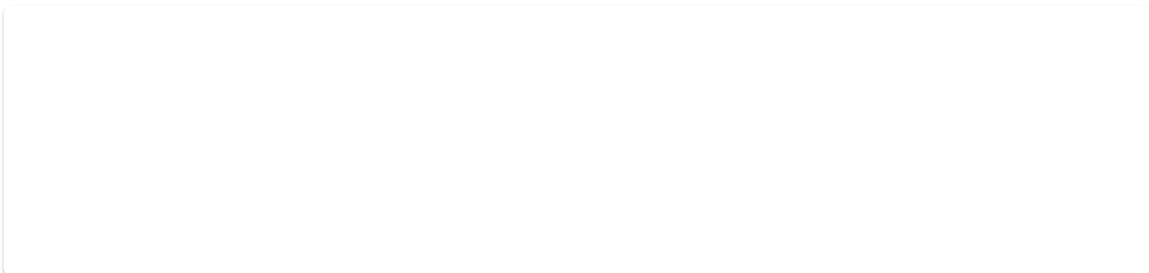
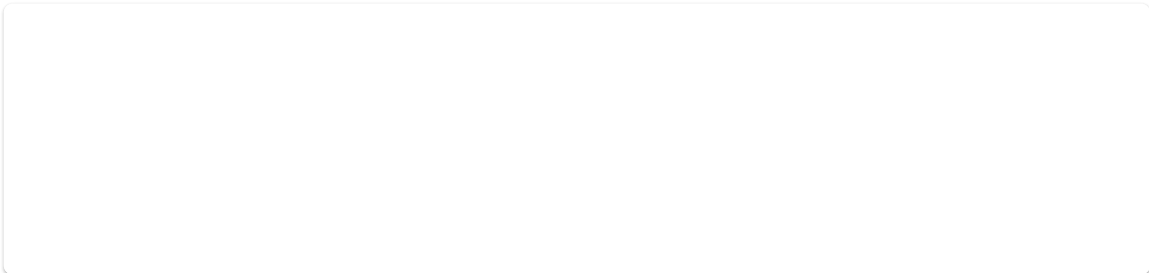
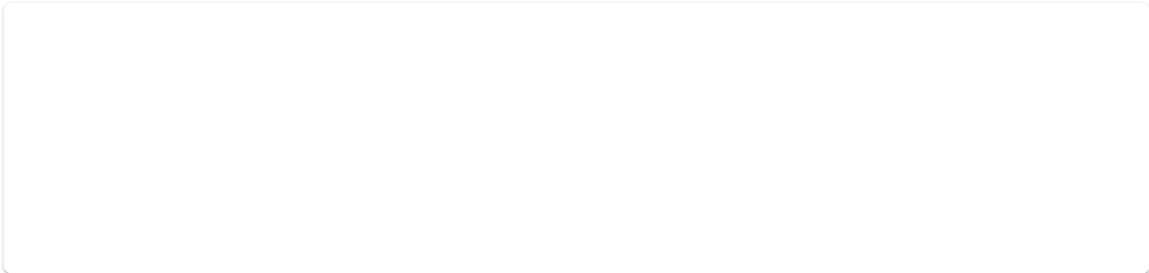
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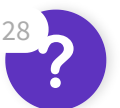
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