Research investigates potential of neem seed oil as a sustainable alternative to petroleum-derived oils

November 15 2023, by David Bradley

Ripening of neem seeds. Credit: Jimmy tikhak/Wikimedia Commons, CC BY-SA

Research in the *International Journal of Surface Science and Engineering*

has investigated the potential of neem seed oil as a sustainable bio-lubricant to replace conventional petroleum-derived oils.

Neem is a tree native to the Indian subcontinent, scientifically known as Azadirachta indica. It belongs to the mahogany family (Meliaceae) and is known for its multiple uses in traditional medicine, agriculture, and various industries. Neem oil, derived from the seeds of the neem tree, has gained attention for its potential applications in various fields, including agriculture (as a natural pesticide), skincare (for its moisturizing and antibacterial properties), and lubrication.

Krishnaprasad S. Menon and R. Ambigai of the Department of Mechanical Engineering at the SRM Institute of Science and Technology in Kattankulathur, Chennai, India, compared formulations of neem seed oil, incorporating additives such as stearic acid and low-density polyethylene (LDPE), with the commonly used mineral oil, SAE20W40.

The study reveals that a bio-lubricant formulation of neem seed oil with 2% stearic acid improves lubricant properties. This particular blend reduces wear scar diameter (WSD) by 30% and almost halves the coefficient of friction (COF) compared to the base oil. Additionally, LDPE, while not impacting tribological properties significantly, enhances the viscosity of neem seed oil.

The findings suggest that neem seed oil, especially when combined with suitable additives, could be a feasible alternative to mineral oil, showing improvements in COF, WSD, and viscosity index. The inclusion of stearic acid is noted for enhancing the lubricant film and contributing to improved friction properties. Moreover, the research suggests that neem seed oil, with proper modifications, may meet the requirements for medium-temperature applications.

However, for neem oil to be technologically competitive with mineral

oil, further exploration of properties such as thermal stability, oxidative resistance, and pour point is necessary. The study demonstrates that the addition of 2% stearic acid improves the pour point of the base oil, making it suitable for low-temperature applications. Additionally, LDPE, despite increasing viscosity, exhibits a limited impact on COF variation, suggesting its potential for applications requiring viscosity improvement.

The research positions neem seed oil as a potentially sustainable lubricant, with stearic acid and LDPE identified as potential additives to enhance its performance. The study opens avenues for continued exploration into the broader applicability of neem seed oil, contributing to the ongoing search for sustainable alternatives in the realm of lubricant technology.

More information: Krishnaprasad S. Menon et al, Evaluation of lubricant properties of bio-lubricant formulations developed from neem seed oil, *International Journal of Surface Science and Engineering* (2023). DOI: 10.1504/IJSURFSE.2023.134787

Provided by Inderscience