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Novel industrial rapeseed oils as bio-base stocks for lubricant production.

Natalia Stawniak
Raymond Sloan,
Harjeevan Kaur,
Ian Bancroft

University of York, York, UK

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University of York, Heslington, York, YO10 5DD, UK

The lubricant industry has long recognised vegetable oils for their excellent lubricity, great viscosity, low volatility, high flash point and low toxicity. Their physicochemical and tribological properties depend on the unique composition of fatty acid triglycerides. For example, the level of unsaturation determines the wear and friction properties of the base stock. Stearic acid is known to reduce wear of metal surfaces due to its saturation and ability to form close-packed monolayers. Increased length of carboxylic acid chains decreases the friction. The major drawback of vegetable oils, including rapeseed oil, is poor oxidative and hydrolytic stability due to the presence of polyunsaturated fatty acids (PUFAs).

Further improvements of feedstock are required to meet demand for an increasing range of applications, with a displacement of mineral oils in order to reduce environmental impact. Using predictive mutation breeding, we have developed a new variety of oilseed rape (Brassica napus L.) with PUFAs content less than 7% and oleic acid content above 85%. The variety belongs to a new family of products with a high oleic, low polyunsaturate fatty acid profile, termed HOLP. Moreover, using HOLP as background, we have created lines with increased erucic levels to 58-61% (HELP, high erucic, low polyunsaturate). Physicochemical tests showed ten times better shelf-life stability of these oils at 20 °C and their oxidation stability extended up to four times in comparison to the conventional rapeseed oils (up to 35h at 110 °C). These bespoke rapeseed oils offer a biodegradable and renewable substitute for mineral oil.