ABSTRACT

Biodiesel from used frying oil can solve waste disposal, environmental degradation, and fossil fuel shortages. This research analyzed the potential of waste frying oils for biodiesel production, with an initial focus on evaluating their physicochemical properties. Samples of waste frying oil (WFO) were taken from different places in Lahore, such as fast-food restaurants and street vendors. The physical study examined color, pH level, density, odor, and viscosity. The samples had a rancid smell, high viscosity, color intensity from 4 to 6, and densities between 0.90 and 0.95 g/mL. Their pH levels were suitable for biodiesel production.

GC-MS analysis showed phthalates and aromatic hydrocarbons in these WFO. Transesterification was employed using potassium methoxide as a catalyst to convert these oils into biodiesel. ASTM standards were used to characterize the biodiesel's viscosity, odor, density, cloud point, flash point, and pour point.

The biodiesel made from waste frying oils met quality standards, including acceptable viscosity (4.10-4.62 CST), neutral odor, suitable density (0.876-0.888 g/cm3), flash points (140-144°C), and cloud and pour points within acceptable ranges. Grading showed that Fri-chicks, Rizwan burger, CVC, and Domestic oil were the best biodiesel samples for engine applications.

This research highlights the viability of utilizing waste frying oils for biodiesel production. Combining physicochemical analyses and GC-MS insights into oil composition shows their sustainable fuel potential. Biodiesel may be improved for practical use through optimization and processing.