EXTRACTION, CHARACTERIZATION AND TRANSESTERIFICATION OF NON-EDIBLE VEGETABLE OILS FROM SOME UNTAPPED SOURCES OF NORTH-EAST INDIA

A total of thirty one non-conventional oilseeds available in the north-eastern states of India were collected, and their oil contents estimated. Nine of them with oil content in the range of 22 to 57 wt.% were shortlisted, their oils extracted, characterized and transesterified. Among the nine samples, oilseeds of walnut (Juglans regia) collected from the state of Manipur recorded the highest oil content of 57 wt.%.

All the nine samples of seedoils were transesterified effectively to afford 90-95 wt.% fatty acid methyl esters (FAMEs) at ambient temperature in 2.5 to 4.5 hours in the presence of a base catalyst derived from the post-harvest biomass waste of Musa balbisiana (a variety of banana plant). Physicochemical properties such as refractive index, acid value, iodine value and density were experimentally determined. Saponification number, cetane number and gross heat of combustion of the nine FAME samples were evaluated computationally. Results indicate that all the nine oil samples were potential feedstock for biodiesel refineries.

Chemical compositions of the nine FAME samples were also determined. Major fatty acids present in the oil samples are palmitic acid (C16:0), oleic acid (C18:1), linolenic acid (C18:2) and stearic acid (C18:0). These fatty acids are invariably present in all the oil samples. Palmitoleic acid (C16:1) was observed in three of the nine samples in low concentrations. Arachidic acid (C20:0) was observed in four samples and behenic acid (C22:0) in only one. Presence of eicosadienoic acid (C20:2) and eicosenoic acid (C20:1) were recorded in none of the samples. It is also interesting to note that none of the oil samples recorded presence of fatty acids with carbon number fewer than 16 (<C16).

Functioning of a few Lewis acids such as FeCl₃, FeCl₃·6H₂O, SnCl₂·2H₂O, SnCl₄·5H₂O, In(OTf)₃ in transesterification reactions were investigated, and among these Lewis acids, FeCl₃ emerged as the best. However, functioning of a novel heterogeneous base catalyst derived from the post-harvest biomass waste of Musa balbisiana Colla (one variety of banana plant) was found still better in many respects including both economic and environmental aspects. This catalyst is a potential cost-effective catalyst for sustaining development of
biodiesel refineries. Thorough investigation into the functioning of the catalyst indicated that it worked by slow release of $\text{CO}_3^{2-}$ ions, the active catalytic species. The catalyst could be recycled up to three times without significant loss of activity. Disposal of the catalyst after use is also possible without any threat to the environment as it contains no toxic or environmentally hazardous chemicals.