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Dereplication and prioritizing drug extraction in natural product research through a green chemistry approach using microwave based technology: An attempt towards industrial scale up

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Abstract

A drug discovery from natural product approach always starts with a basic extraction process which is often least though of. An inefficient extraction step can definitely jeopardize the entire mission. Conventional methods are time consuming, detrimental to environment and not thermally safe. In this regard an ecofriendly, green microwave-assisted extraction (MAE) technique was developed for the rapid extraction of bioactive oleanolic acid from *Gymnema syslvestre* leaves with an objective for large scale commercial extraction. Several different influential extraction parameters such as microwave power, extraction time, solvent type, solvent composition, preleaching time, loading ratio and extraction cycle was studied to make the process robust. MAE was performed using a microwave extractor where controlled irradiation was given to the leaf powder sample. Under optimum conditions, 8 min of MAE produced a maximum yield of 7.6 % w/w of oleanolic acid which was found to be 22.6%, 300% and 230.4% more effective than heat reflux extraction, maceration and stirring extraction respectively. Extracts obtained from 8 min of MAE showed an IC50 of 32 µg/ml when compared to the IC50 value of 55 µg/ml obtained from 6 hours of heat refluxed sample, thus indicating better antioxidant activity when compared to conventional methods. No degradation of the target analyte was observed and the proposed method also showed high degree of reproducibility with an average recovery of 98.2%. From the results of scanning electron microscopy a new synergistic phenomenon of heat transfer and mass transfer was proposed to explain the phenomenon of increased yield. With regard to environmental impact, the carbon load of the process was 27 times lesser than the conventional methods.

Biography

Vivekananda Mandal completed his PhD from Jadavpur University, India in 2012. Currently he is working as Assistant Professor in a Central University at Bilaspur. He has developed and patented indigenous low carbon print microwave based technology for the rapid and thermally safe extraction methods for botanicals. In this regard he has authored a book (in press). He has published several research papers pertaining to his innovative work in reputed and indexed international journals